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Global biodiversity

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Research, Conservation and Wise Use

THE BUSINESS OF ENVIRONMENTAL LAW: ENFORCEMENT WORKS

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CONSERVING THE GRAY WOLF

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THE POWER OF SEEDS

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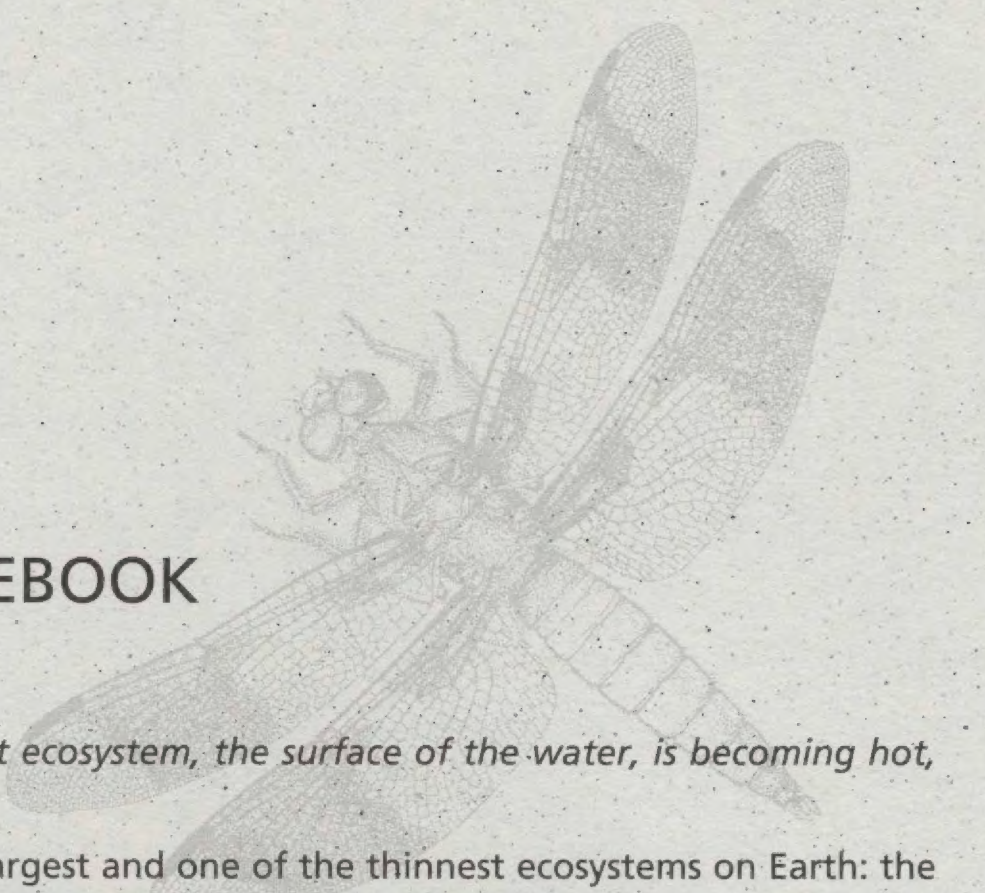

EDITOR'S NOTEBOOK

Surface tension

Life in the earth's thinnest ecosystem, the surface of the water, is becoming hot, toxic and dangerous.

The neuston inhabit the largest and one of the thinnest ecosystems on Earth: the surface skin of the ocean. Neuston are the tiny and small-size organisms that sit on, or just under, the water's surface film. Sunlight penetrates this film, wind agitates the surface, gas exchange takes place with the atmosphere, and air-borne pollutants fall into it.

In this thin, layered environment neuston life thrives. Resident neuston pass their entire lives here, but most of the inhabitants are part-time visitors. Major groups living in this thin world and in the upper photic zone include the plant (phyto-) and animal (zoo-) plankton. Sunlight is strong at the surface, but so long as nutrients are available, the phytoplankton thrive, and the zooplankton feed on them. The eggs and larvae of many mid-water and bottom-dwelling organisms float up to the surface to feed on the rich plankton soup; this includes the eggs and larvae of numerous important commercial species such as the Atlantic cod. Plankton snow—that is, dead plankton—fall from the surface to the bottom in both shallow and deep water, feeding a variety of bottom life. Obviously, what happens to the neuston affects much of the planet's coastal and ocean biodiversity, including its fisheries.

We know that the neuston are affected by a number of antropogenic impacts such as the increasing ultra-violet radiation (UV) due to the thinning of the ozone layer, especially in polar areas. This can kill phytoplankton and affect poorly pigmented zooplankton and larvae. Oil slicks from marine- and land-based sources float on the surface, and their aromatic components can be toxic to eggs and larvae. The oil film may also prevent fish larvae from swallowing the vital "seed bubble" that triggers the functioning of the swim bladder (the gas-filled, balloon-like structure in the abdominal cavity) [see: *Sea Wind* 12(2): 27-31], thus permitting normal development. Atmospheric pollutants fall into the water as particles or dissolved in rain. At the poles, volatile persistent toxins condense on the surface of the water. Land and river runoff with all their pollutants usually floats on the sea surface. Ocean warming, which is due to greenhouse gas-mediated climate change, affects mostly the surface as hot water is less dense and therefore rises.

The effects of UV radiation, oil pollution, atmospheric and terrestrial contaminants, and ocean warming are concentrated at the surface of the oceans, home of the most biologically active and influential marine ecosystem. With fishery stocks crashing worldwide, we should rigorously investigate the degree to which the forces attacking the neuston are impacting the wider ecosystem as well.

Don E. McAllister

Don E. McAllister
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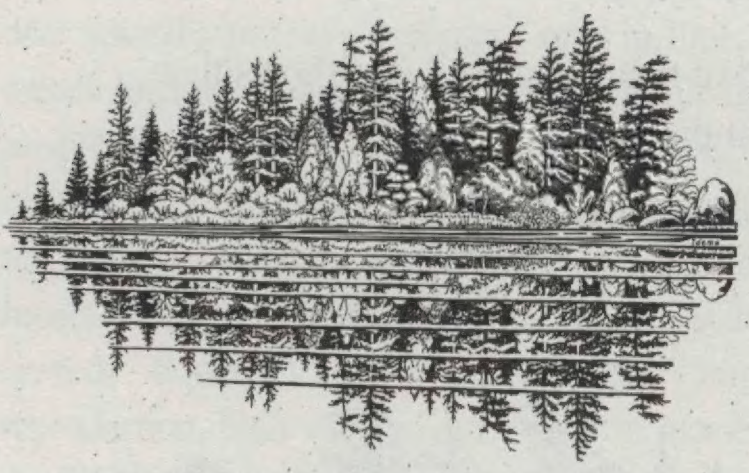

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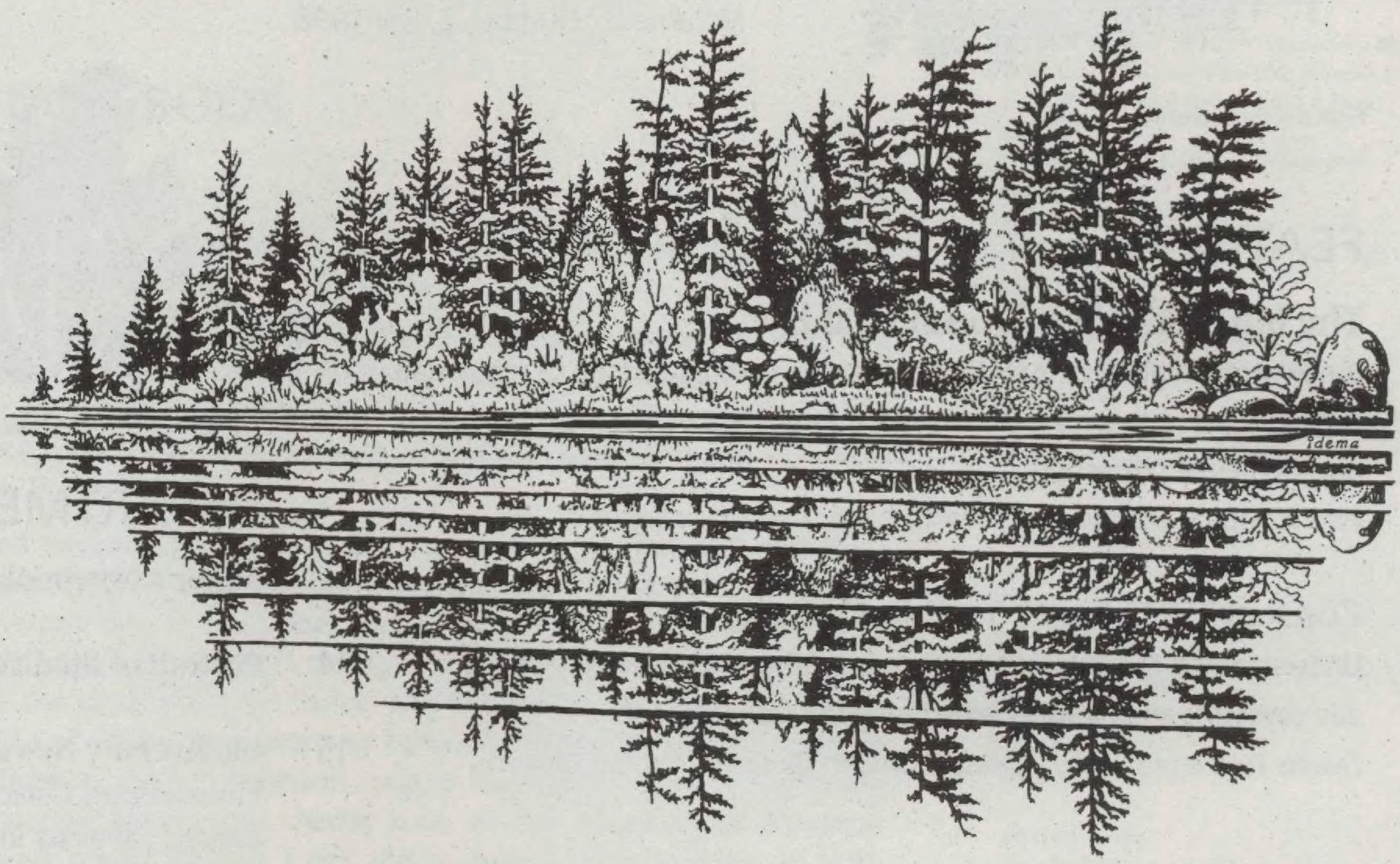
The business of environmental law

A new study explodes the myth that industry does a good job of regulating itself and shows that government enforcement strategies mean better environmental protection

by Peter K. Krahn, P.Eng., Acting Head, Inspections Division, Environment Canada, Pacific and Yukon Region



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INTRODUCTION

Governments around the world are considering substitutes for monitoring and enforcing environmental law within industries. Many believe the industries that harm the environment should be allowed to monitor themselves and that they will voluntarily comply with the law. Parts of the private sector favour this approach, while many citizens, members of the scientific community and environmental organizations doubt the effectiveness of voluntary compliance, seeing it as no more than wishful thinking on the part of governments. This study provides a factual basis for policymakers when determining the best course of action. Other jurisdictions may find the results of this work useful when analyzing their local or national concerns about adherence to environmental law.

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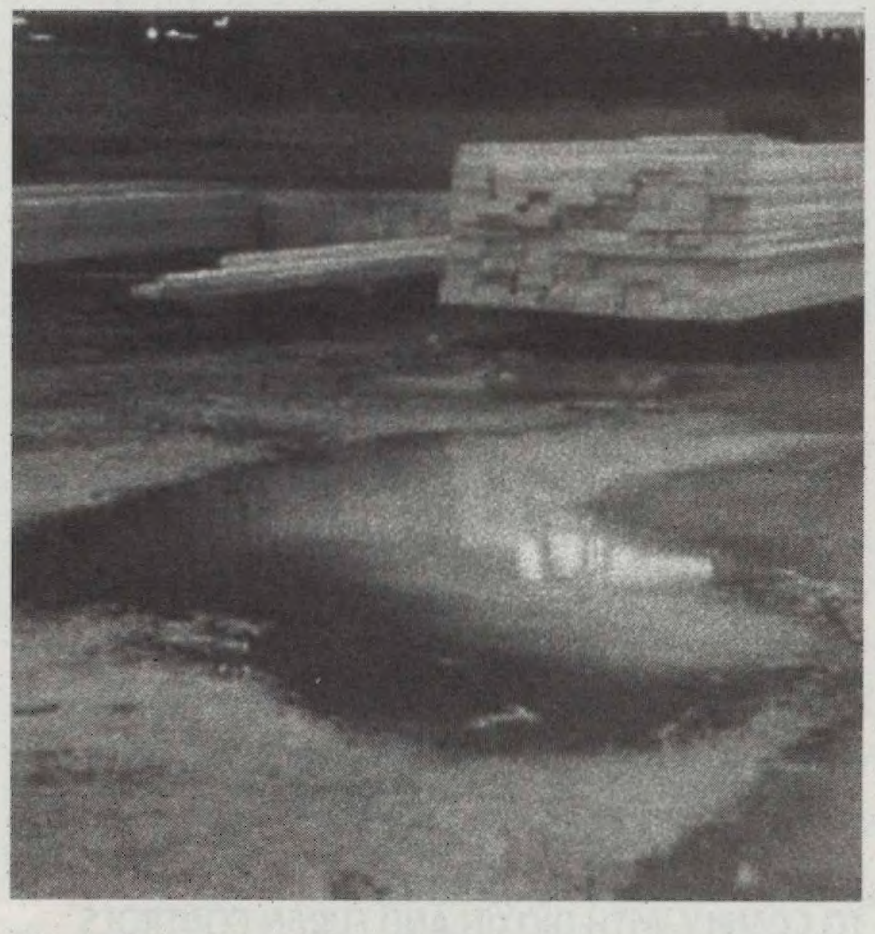
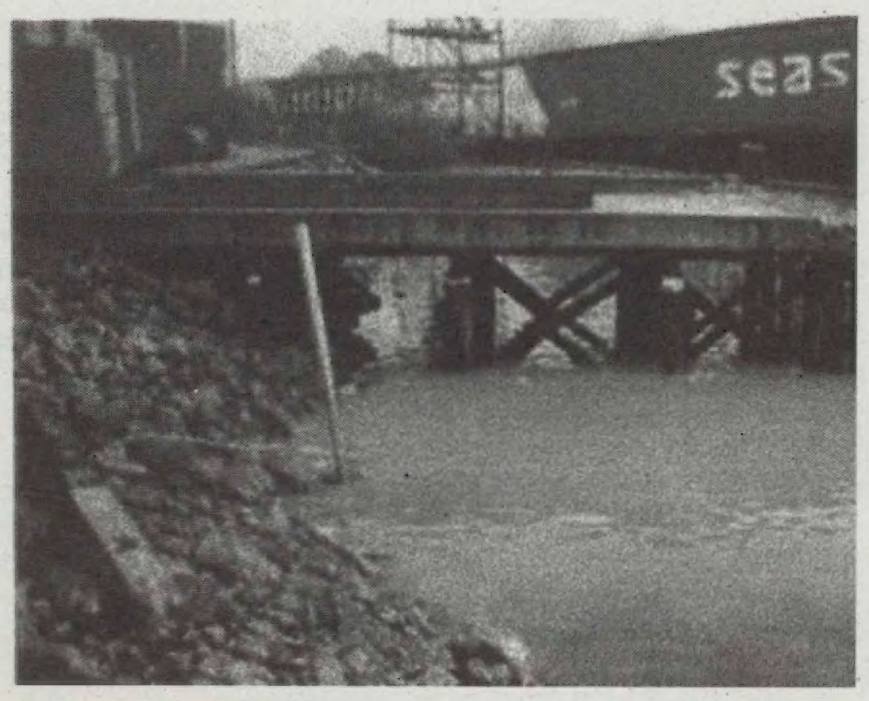
Wood preservation facilities and pulp and paper mills in British Columbia (BC) discharged over 750 million cubic meters of toxic effluents in 1986. Concentrations of chlorophenols, copper, chromium, arsenic, creosotes and natural wood extractives in these discharges could cause 100% mortality of salmon in under eight minutes. Pentachlorophenol, a wood preservative that was the most widely used wood fungicide in BC, inhibits the ability of an organism to convert food into energy, resulting in suffocation and heart failure at 30 parts per billion (ppb). Pentachlorophenol was detected throughout the lower Fraser River and in marine waters near sawmills and pulp and paper mills in 1986. Heavy metals such as copper, chromium and arsenic (used in long-term wood preservation) are acutely toxic to fish at concentrations as low as 20 ppb and were discharged at levels exceeding 9,000 ppb. Dioxins and furans which are bio-accumulative and cause immune system damage, liver dysfunction, impaired reproduction, birth defects and cancer in mammals in the parts-per quadrillion range were detected in all pulp mills using a chlorine bleaching process.

In response to these findings, Environment Canada—responsible for enforcing the Canadian Environmental Protection Act (CEPA) and the pollution prevention provisions of the federal Fisheries Act—initiated the Fraser River Action Plan (FRAP) in 1992. The department's Pacific and Yukon region set out to stop and reverse existing environmental contamination and degradation of the river by implementing strategies to reduce pollution and virtually eliminate the discharge of persistent toxic substances. Four years later, the enforcement division conducted a review of historical data related to the compliance with technical criteria and effluent discharge limits by 19 industrial sectors. This study demonstrated that in most cases voluntary measures achieved a minimal positive result for both compliance rates and reductions in toxic discharges. It showed as well that mandatory environmental law enforcement strategies dramatically improved average compliance rates from a pre-enforcement average of 60% to over 90% and subsequently reduced environmentally harmful effluent discharges by up to 99%.



Chlorophenates leach from freshly treated lumber prior to implementation of regulations.
Photo: Peter Krahn



Contaminated storm water runoff discharges into the Fraser River with flouroscene dye used to highlight the zone of impact.
Photo: Peter Krahn

HOW A COMPLIANCE AND ENFORCEMENT PROGRAM ROLLS OUT

The examination of 19 industrial sectors in the compliance study revealed distinct phases in an enforcement cycle that will last from five to ten years, depending on the intensity of the program. Compliance history and some random selection determined which facilities were chosen for examination. Phases 1 and 2 involve the scientific assessment of an environmental issue and the development of best practices. Field inspection techniques are designed and tested in phase 3 and implemented in phase 4, where up to 80% of the facilities may be brought to a reasonable level of compliance.

Phase 5 includes strategic enforcement initiatives that may lead to investigation of up to 5% of the facilities in any industrial sector. Prosecution and conviction of up to 2% of the facilities occur in the sixth and seventh phases. Conviction can mean fines of up to $1 million per day for each day of the offence and/or three years imprisonment. Court orders may prohibit businesses from undertaking certain activities or may require them to improve fish habitat, publish facts about the offence, pay compensation, perform community service or post performance bonds. The eighth and final phase involves re-inspections to verify compliance with official warnings, directions and court orders.

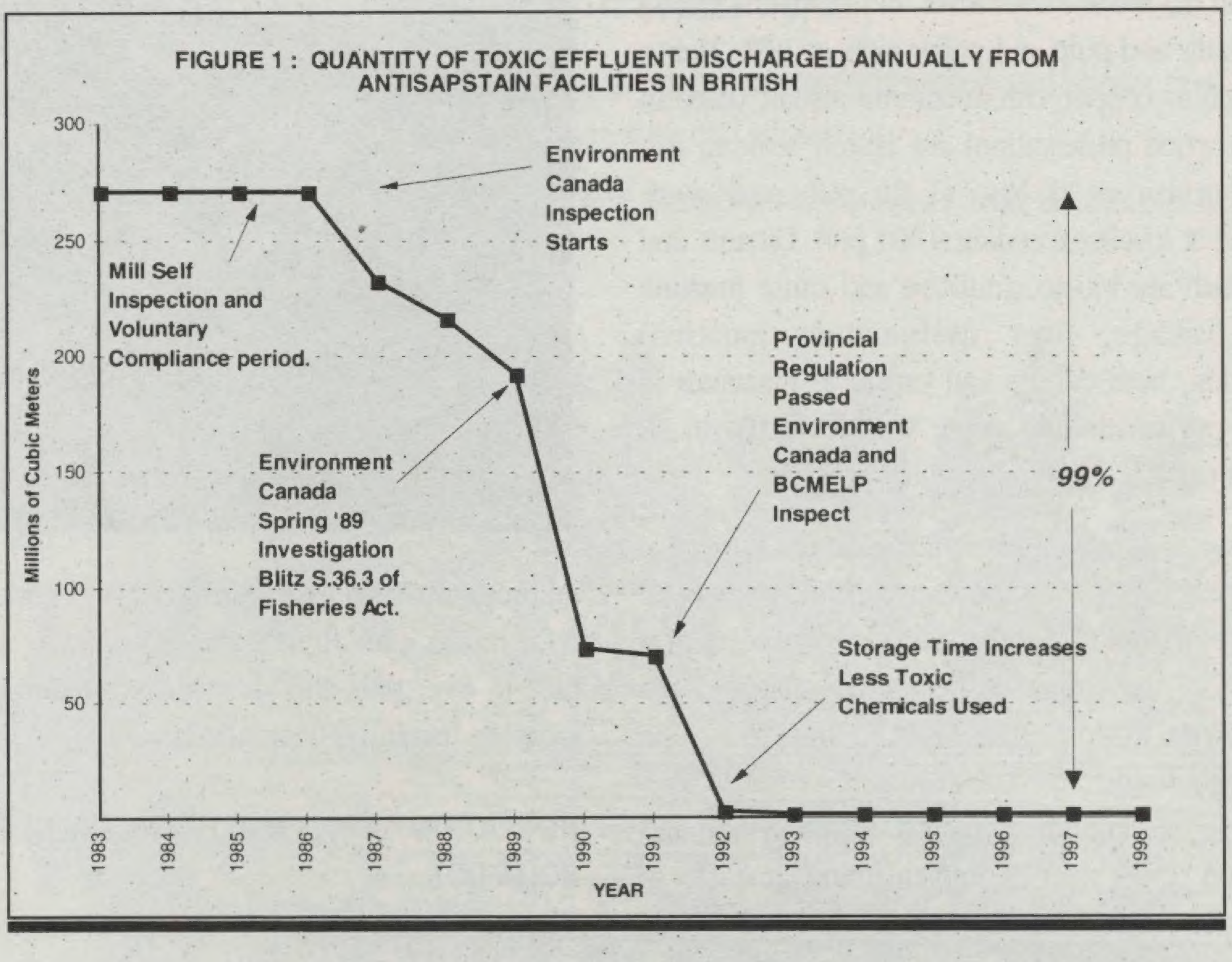


FIGURE 1 : QUANTITY OF TOXIC EFFLUENT DISCHARGED ANNUALLY FROM ANTISAPSTAIN FACILITIES IN BRITISH

Figure 1
From 1983 to 1986, mill operators conducted a voluntary self inspection program which failed to yield a significant improvement in operational procedures or reduction of toxic discharges.

CASE STUDY 1: ENFORCING COMPLIANCE IN THE ANTISAPSTAIN WOOD PRESERVATION INDUSTRY

British Columbia supplies an estimated 39% of the world's soft wood lumber supply and annual sales have often exceeded $4 billion, providing major employment and tax revenues. Prior to 1983, water-based solutions of pentachlorophenol (PCP) and tetrachlorophenol (TTCP), called antisapstain chemicals, were used to treat wood at sawmills to control molds and fungi that attack freshly cut wood. The treated lumber was then moved to exterior storage yards where it was exposed to precipitation. Rainwater leached the chemical from the wood and an estimated 250 million cubic meters of acutely lethal effluent were discharged annually from these facilities into fresh water and marine environments that supported valuable salmon and other fish and shellfish stocks. The tidal effect on the lower Fraser estuary caused storm water discharges to stagnate near outfalls, which created immediate zones that were acutely toxic to fish and sub-lethal zones of up to 600 meters in length.

From 1986 to 1989, Environment Canada initiated a voluntary compliance program using specific checklists and on-site visits combined with compliance promotion seminars (*Figure 1*). The progressive mills implemented proper chemical handling and treatment procedures or constructed facilities to control or prevent releases. However, a significant proportion of the mills did not implement corrective measures. During this period, charges were not laid for improper practices.

In early 1989, Environment Canada's enforcement staff embarked on a strategic enforcement initiative, targeting five mills for investigation and ultimate prosecution as a result of their severe non-compliance. As part of this enforcement initiative, a federal/provincial committee drafted a regulation, enacted by the BC government in 1991, to make a number of environmentally sound operating practices mandatory. A comprehensive inspection and sampling program by federal and provincial inspectors followed. Under the new regime, incentives encouraged businesses to develop new, less toxic chemicals; and to improve facilities or find alternate markets that did not require treatment. By 1993, the quantity of acutely toxic effluent discharge decreased by an estimated 99%.

CASE STUDY 2: BC ENFORCES PULP AND PAPER MILLS TO COMPLY WITH DIOXIN AND FURAN CONTROLS

There are 75 variations of dioxins and 135 varieties of a related group of chemicals called furans. The most environmentally disruptive are 2,3,7,8-tetrachloro-para-dibenzodioxin (2,3,7,8-TCDD) and 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) which are defined as toxic chemicals under the CEPA. The two primary sources of these chemicals were saw mills and pulp and paper mills that used chlorine in their bleach plants. In the late 1980s, Environment Canada and the Department of Fisheries and Oceans collected numerous sediment, crab and shellfish samples in areas near sawmills and pulp mills. Following the analysis of these samples, 1,200 square km of crab and shellfish harvesting areas were closed.

New federal pulp and paper regulations passed in 1989 required an immediate ban on the purchase and use of wood products contaminated with chlorophenols as feed stock and prohibited the production, import or sale of defoamers contaminated with dioxin and furan precursors. The mills implemented these bans in anticipation of the mandatory regulations, resulting in a 99% reduction in the discharges of the two regulated chemicals, 2,3,7,8-TCDD and 2,3,7,8-TCDF *(Figure 2)*.

CASE STUDY 3: ACUTELY LETHAL DISCHARGES FROM BC'S HEAVY-DUTY WOOD PRESERVATION MILLS ARE DRASTICALLY REDUCED

Water-based mixtures of copper/chromium/arsenic or oil-based mixtures of pentachlorophenol or creosote are used in the production of pressure - or thermal - treated lumber and poles used for telephone and power distribution lines, railway ties and structural and landscaping materials. The treatment and storage of finished products resulted in annual discharges of up to 1 million cubic meters of contaminated storm water runoff from all 18 heavy-duty wood preservation mills in BC. An estimated 600,000 cubic meters per year entered surface and ground water systems of the Fraser River from six mills located near Vancouver *(Figure 3)*.

Environment Canada developed five codes of practice in 1984 that were voluntary measures to be implemented by the industry to prevent spills, control contaminated storm water runoff and contaminated waste disposal. In 1987, Environment Canada informed the industry of the results of studies concerning contamination of soils and, in particular, storm water runoff.

From 1983 to 1991, the industry operated under a voluntary program to implement Environment Canada's code of practice recommendations. In 1991, the department conducted further scientific research that confirmed these mills were still releasing significant quantities of acutely toxic effluent. Each mill was informed of the results, however no significant operational changes occurred under the voluntary program. In February 1994, Environment Canada initiated an intensive inspection and

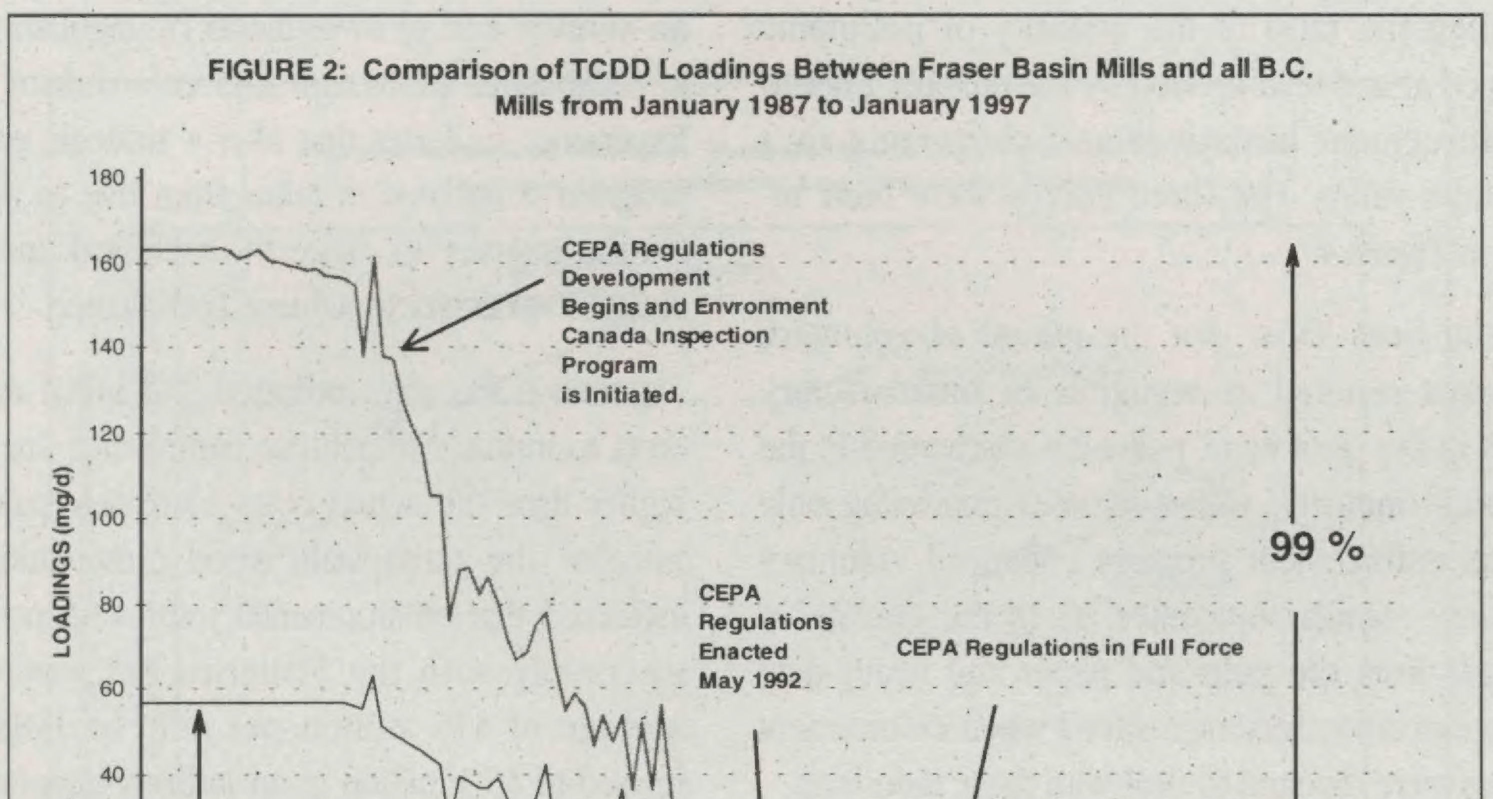


FIGURE 2: Comparison of TCDD Loadings Between Fraser Basin Mills and all B.C. Mills from January 1987 to January 1997

Figure 2
Data shows that when mills implemented bans in anticipation of mandatory regulations, a 99% reduction in the discharges of the two regulated chemicals, 2,3,7,8-TCDD and 2,3,7,8-TCDF, occurred.

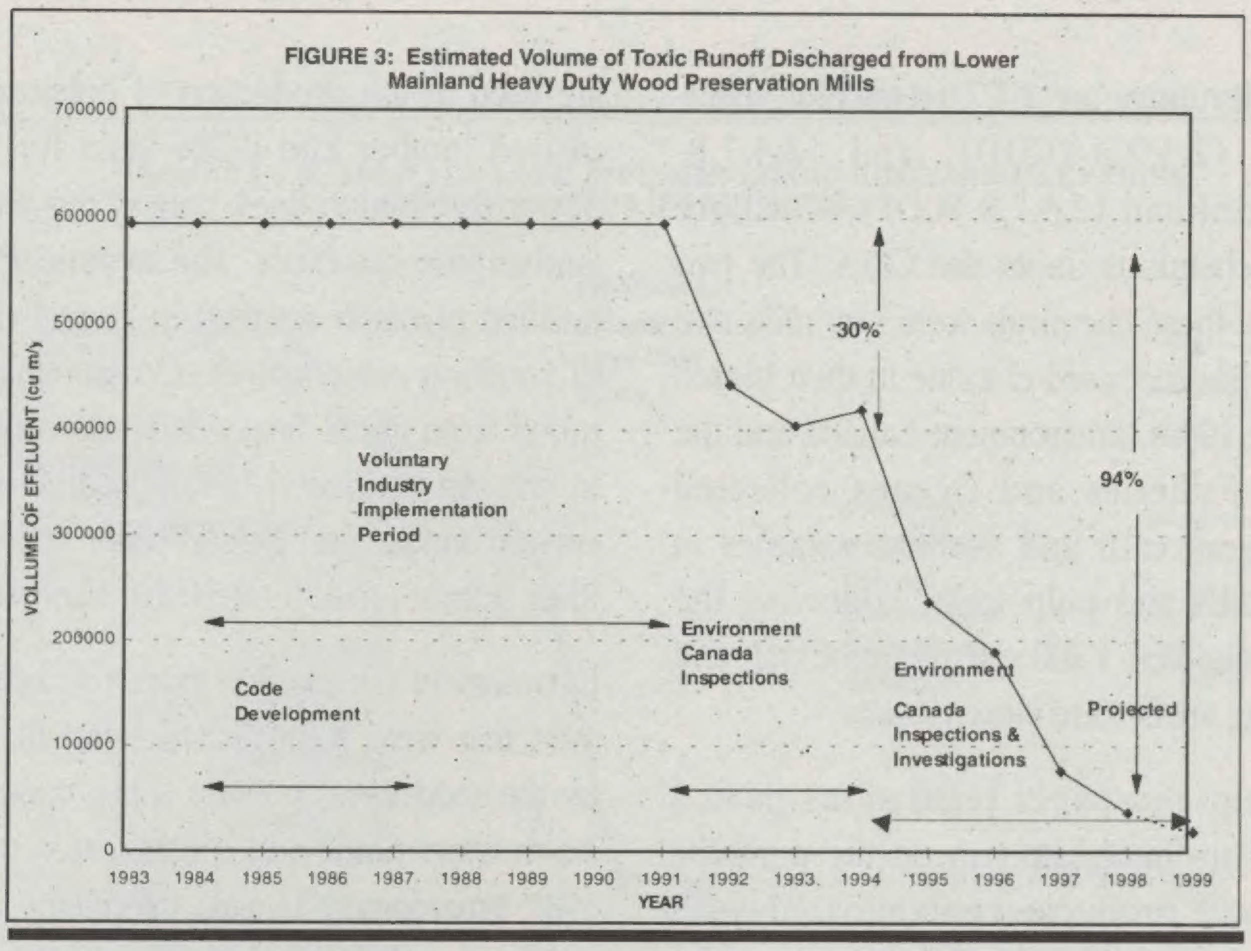


Figure 3
Since 1994, the discharge of acutely lethal effluent from this industry sector has decreased by over 90%.

investigation program that targeted all six Greater Vancouver mills for violations of the Fisheries Act. Since 1994, the discharge of acutely lethal effluent from this industry sector has decreased by over 90%. Recent follow-up inspections have verified that there has been a 34-85% reduction in the quantities of environmentally harmful substances in Fraser River sediments adjacent to the five mills where investigations were initiated.

ANALYZING THE TRENDS OF INDUSTRY TO COMPLY

The data from Figures 1, 2 and 3 were normalized by calculating the ratio of the quantity of pollutants discharged at any time divided by the quantity prior to the enforcement initiatives and converting to a percentage value. The three curves were then replotted in *Figure 4*.

The trend lines show that the period of voluntary compliance resulted in negligible or unsatisfactory changes in the quantity of pollutants discharged in the antisapstain industry, with outcomes improving only when an enforcement program enhanced voluntary compliance. Similar outcomes, as in the decline of discharges from the pulp and paper and heavy-duty wood preservation sectors, resulted when enforcement resources were diverted to deal with these industries.

These observations support the data reported in the 1996 Canadian Environmental Management Survey, which found that the most influential factors for promoting environmental change were: compliance with regulations at more than 90%, board of director liability at over 70%, employees at more than 60%. The least influential factors were: voluntary programs 15-20%, interest groups 10-12% and trade considerations at under 10%.

THE ECONOMICS OF COMPLIANCE PROMOTION AND ENFORCEMENT PROGRAMS

There are three primary economic issues encountered in the development of a compliance and enforcement program: a) costs to the regulatee (company) to implement corrective measures, b) competition within an industry and c) investments by regulatory agencies in compliance promotion and enforcement programs. Experience indicates that after a strategic enforcement program is initiated, it takes from five to seven years for the industry to make the technical and structural changes necessary to achieve compliance.

Experience has also indicated that initial estimates of costs to industry to achieve compliance are frequently higher than the actual costs ultimately paid out. For instance, the antisapstain wood preservation industry estimated that environmental improvements necessary to comply with the Fisheries Act would cost an average of $10 million per mill. In 1988 this was revised to $5.3 million in an industry-generated report. The actual costs experienced by 1996 ranged from $1 million to $1.5 million per mill.

Facilities that implement corrective changes can suffer a significant economic penalty if they compete in regional, national or international markets that reflect great disparities in environmental legislation and enforcement. For instance, the average British Columbia pulp and paper mill with a production of 1,000 tonnes per day incurs a daily cost of $30,000 ($9 million annually) to meet environmental standards. If a mill of similar size in another region does not comply with the same standards, it will gain an economic advantage of $9 million or more, depending upon interest rates and capital cost factors.

Implementation of targeted enforcement programs incurs an expense to the government that is distributed to the entire population through taxation. The federal government spent $600,000 in operational costs for the heavy-duty wood preservation enforcement program. The industry costs to comply with the federal and provincial requirements will total $39 million by September 1998. This is nearly a 1:70 ratio of federal government expenditure provoking industry expenditure. Under targeted enforcement programs, the costs of environmental improvements are initially borne by the facility and then passed on to the consumer of the particular product. In this manner, the "polluter pay" principle is directed more to the producer and consumer of the products; whereas should the government offer a grant or tax benefit program, that would distribute the costs to the public at large, many of whom may not use the products.

CONCLUSION

In order to maintain and sustain a healthy ecosystem, we must reduce the quantity of toxic and environmentally disruptive chemicals that are discharged, thereby enhancing habitat for people, plants and animals. Many people believe that good environmental management practices can be implemented on a voluntary basis by industry. But as the evidence provided in this paper demonstrates, such a belief is often wishful thinking and is rarely borne out in the real world.

The compliance rates of industrial sectors engaged in voluntary compliance programs in British Columbia averaged a 60% implementation rate of best management practices, frequently resulting in the discharge of toxic or environmentally harmful effluents. Regulated industries that were subjected to federal (or combined federal/provincial) inspections and/or four to five years of sustained enforcement initiatives averaged a 94% compliance rate. Furthermore, among these industries, the discharges of harmful substances frequently decreased by over 90% from the pre-enforcement period. These trends were observed in 19 industrial sectors, which indicate that a strong enforcement program is necessary to provide incentives for voluntary initiatives.

Good managers will pursue methods that are beneficial on both a cost and environmental basis, but

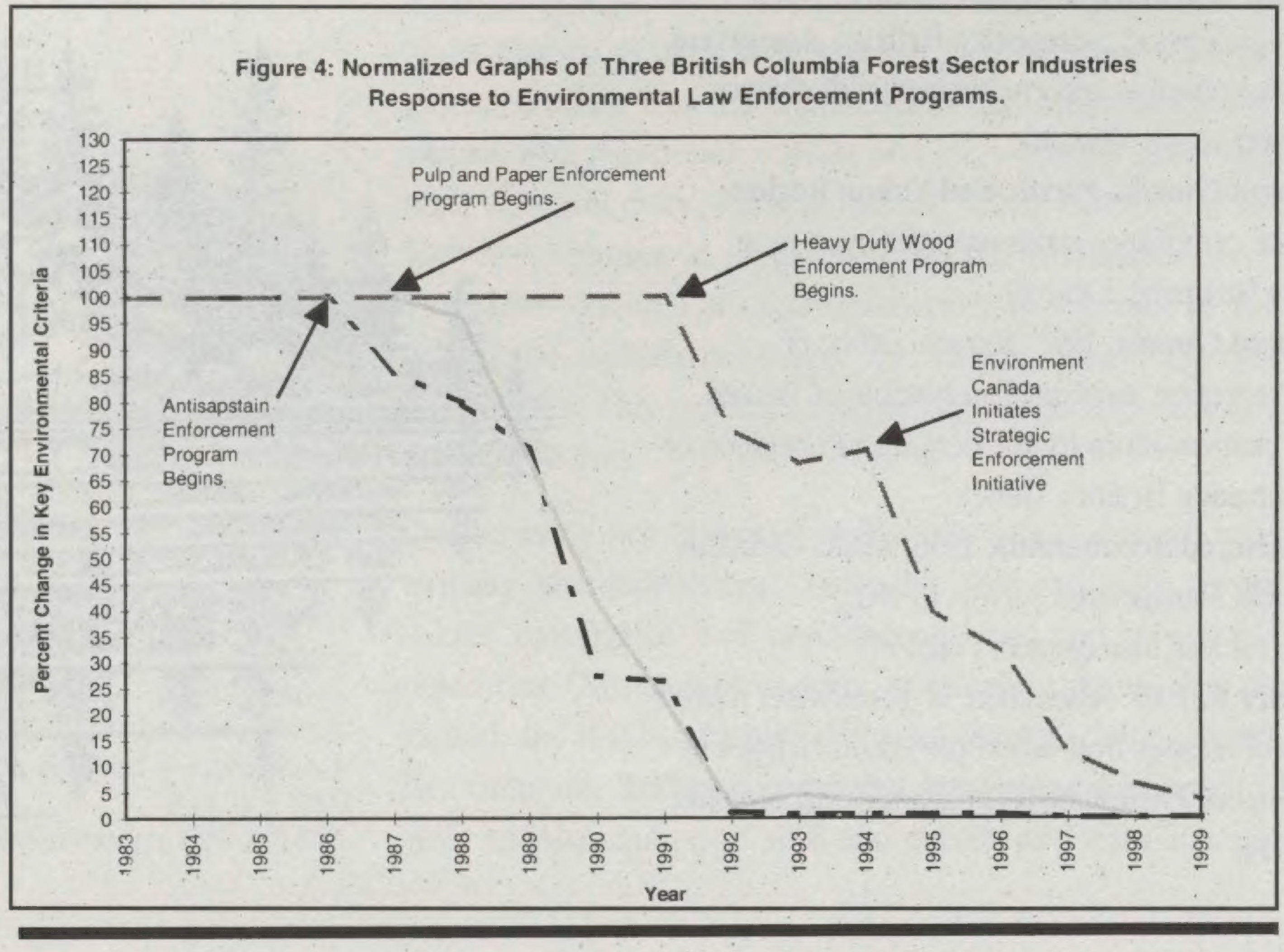


Figure 4: Normalized Graphs of Three British Columbia Forest Sector Industries Response to Environmental Law Enforcement Programs.

Figure 4
Negligible or unsatisfactory reductions in pollution occur under voluntary compliance by the antisapstain industry.

they will encounter barriers to this dual effort that are imposed by economic competition. The nature of the competitive environment makes industry owners and/or managers poorly suited to impose environmentally responsible operating conditions on recalcitrant members of their particular sector. However, properly designed environmental law enforcement programs level the economic playing field, thus reducing the impact of competition in society's efforts to protect the environment by focusing the cost of pollution control on the producers and consumers of polluting products and services.

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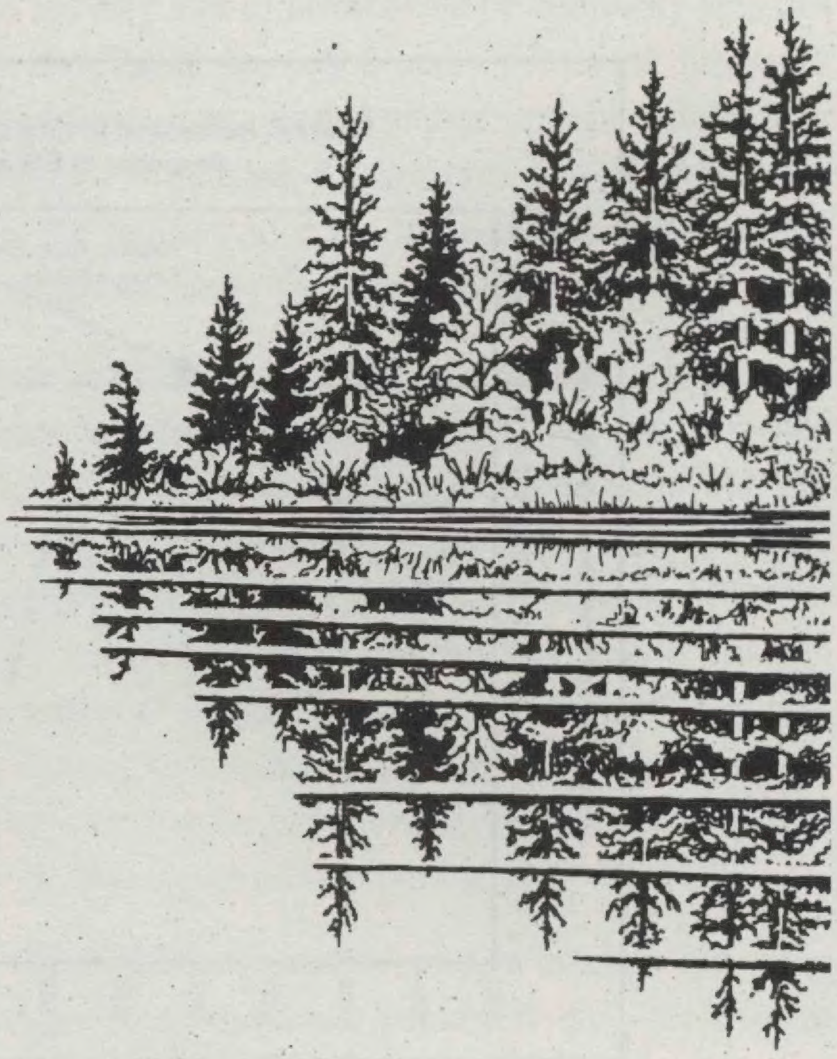

Conserving the gray wolf in Ontario

Understanding the changing taxonomic relationships among wolves and coyotes is an essential element of good management

Dennis Voigt and Maria de Almeida

Algonquin wolves
(*Canis lupus lycaon*)
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THE LONG-TERM VIEW OF THE WOLF AND ITS ECOSYSTEM

Dramatic changes in forest habitats and animal distribution have occurred since glaciation over 10,000 years ago. Wolf populations historically extended south into the United States and undoubtedly interacted with various wolf subspecies, coyotes and red wolves (*Canis rufus*), as well as with different prey, such as moose, deer, caribou, buffalo and elk. However, changes in predators, prey and landscapes over the last 200 years have occurred at unparalleled rates—a reflection of the intensity of man-made disturbances over the slower impact of historic natural disturbances. This accelerated rate of change is important to conservation plans for wolves.

Ontario has a rich history of wolf (*Canis lupus*) research when compared to many other jurisdictions. During the 1960s and 1970s, several major field studies investigated wolf population ecology and behaviour. Researchers noted that Ontario wolves were extremely variable, that several 'types' existed, and that hybridization between coyotes (*Canis latrans*) and wolves had occurred. Studies showed that large areas supported a Boreal-type wolf, an Algonquin-type wolf and coyote, and transition areas including

"... it appears that populations of the 'Algonquin' wolf (*Canis lupus lycaon*) have hybridized with coyotes."

Coyote
Illus.: Roelof Idema

intermediate *Canis* (the Tweed type: coyote x wolf) were also observed. As well, predator-prey systems have varied and changed over time. Coyotes entered Ontario around the turn of the century and spread throughout the province wherever fragmented landscapes occurred; deer, moose and beaver populations fluctuated dramatically in numbers; and moose and deer populations fluctuated in distribution.

RECENT DEVELOPMENTS IN HOW WE STUDY WILDLIFE SPECIES

In recent decades, the disciplines of landscape ecology, conservation biology and biogeography have emphasized broader scale processes and the hierarchical nature of ecosystems. Both forest ecosystem and predator-prey studies show the dynamic nature of these systems. The importance of natural disturbances for sustainability and the maintenance of biodiversity is becoming widely accepted. Landscape patterns that contain large natural areas do not operate in the same way as fragmented landscapes. However, natural complexity and heterogeneity also appear to be critical. All of these factors have important implications for the management of many wildlife species, especially for keystone species, such as wolves, that operate over large areas and act as a summit predator in many systems. These factors also impact how we manage parks, protected areas and surrounding landscapes.

Ironically, recent recent fine-scale molecular studies in genetics have enhanced our understanding of broad-scale processes. DNA analyses allow us to investigate wolf history and interactions of populations of wolves on a broad level. For instance, genetic studies confirm many of the morphological patterns described by Kolenosky and Stanfield (1975). Based on work by Wilson et al (1996), it appears that populations of the "Algonquin" wolf (*Canis lupus lycaon*) have hybridized with coyotes. This is particularly relevant because reclassifications of wolf subspecies suggest far fewer types, of which *C. l. lycaon* is one (Nowak 1995). This subspecies is a smaller wolf that historically extended into the US but now occupies a remnant range in Ontario and Quebec. Its relationship with wolves to the north and west and coyotes to the south is unclear. For example, it is not known whether Algonquin wolves interbreed with Boreal wolves (*C. lupus nubilus*) or even where the line between them occurs. Nowak drew a line from Sault Ste. Marie to north of Temagami, but he had few specimens to validate its position and the difference could be thousands of square kilometers. Wayne and Lehman (1992) have found coyote genes in wolf populations from Minnesota to Quebec. It is not known where coyote introgression has changed in frequency, or even whether there is a changing morphological or ecological effect (Wayne et al 1995).

Recent studies in Algonquin Provincial Park are very relevant. Dr. J. Theberge has studied an east-side wolf population for a decade that has shown considerable movement outside the park (primarily to seek wintering deer). Such movement is probably relatively new since deer were the primary cervid wintering in the park until the early 1960s when the population started to decline. Protection of wolves in Algonquin Provincial Park began about this time as well. At present, Algonquin Provincial Park is the largest area in *C. l. lycaon* range that protects wolves [notwithstanding Lake Superior Park, Chapleau Crown Game Preserve and Nipissing Crown Game Preserve that are larger than the 500 km^2 minimum area identified by Theberge as able to support a viable wolf population]. It is unknown whether there are large movements in or out of Algonquin Provincial Park along its other boundaries.

Although the Park must be regarded as the core of the *C. l. lycaon* range, it is also unknown whether populations of wolves in the rest of the Great Lakes-St. Lawrence Forest are different from the Algonquin Provincial Park wolves. We know that wolves occur across the entire landscape, but it is unlikely that densities are comparable in many areas.

Theberge has recently collected material from Algonquin wolves for DNA analysis (Wilson et al 1996). The preliminary analyses show that the samples also contain an allele (gene) that has not been found before in wolves. However, the closest samples that have been investigated are from Minnesota and Quebec.

CLARIFYING THE TAXONOMY OF ONTARIO *CANIS* SPECIES

The Ontario Ministry of Natural Resources (OMNR) collected over 2,400 wolves and coyotes from trappers and hunters across Ontario from the late 1950s to the mid 1960s. The skulls from these specimens have been cleaned and retained along with specimen information, such as location, date, sex and, in some cases, weight and various body measurements. A portion of the collection is from Algonquin Provincial Park and includes specimens trapped during the experimental removal program in 1964-65. This collection allows for a unique evaluation of the variability in *Canis* from southern to northern Ontario at a point in time (about 40 years ago) after the coyote spread through Ontario. Wolf/coyote hybrids are included in this sample. A genetic analysis of this collection would help determine the relationships among various populations of wolves in Ontario. In addition, OMNR has also kept the specimens from the wolf/coyote hybridization studies conducted by Kolenosky in the 1970s, and we know the pedigree of some of these animals.

Using this collection, OMNR initiated collaborative genetic research with Brad White and Paul Wilson of the Wildlife Forensic DNA Laboratory at Trent University. OMNR provided samples, a database and support for the analysis. The collection and preparation of such a large sample today would be a major and expensive undertaking.

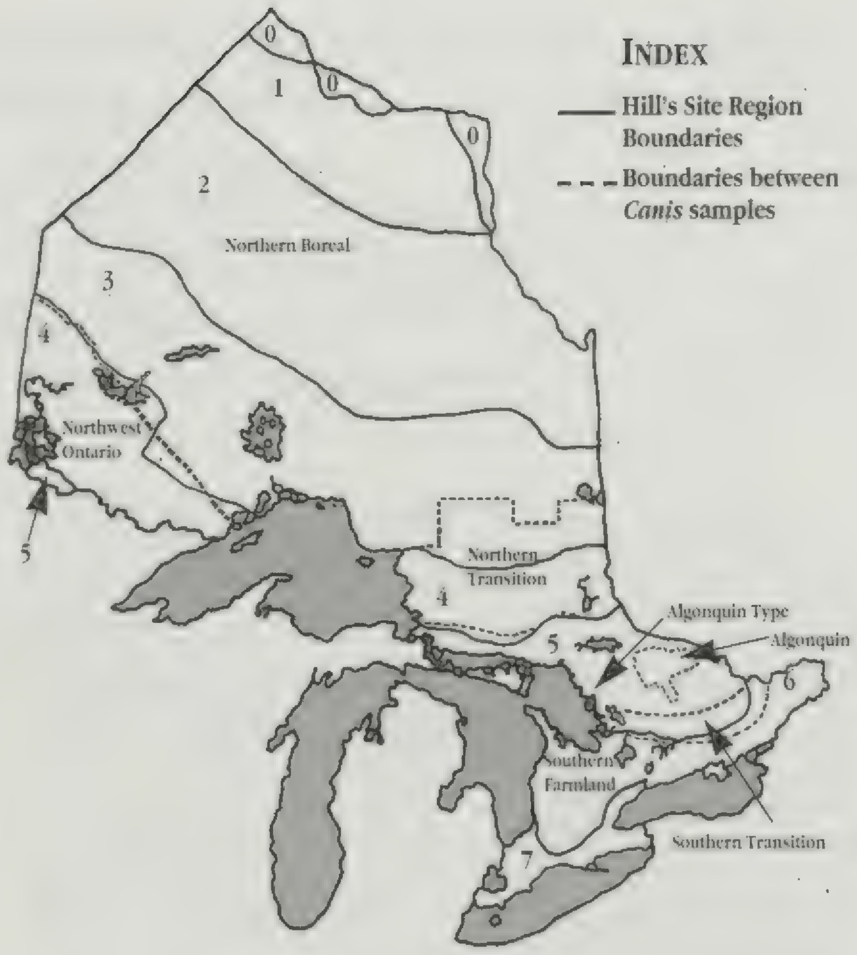

Figure 1: Map showing stratification for *Canis* sp. in Ontario

The sample was stratified into the following seven classes and a portion of dental root material was removed from 20 males and 20 females from each class (*Figure 1*):

1. northern Boreal wolves
2. northwestern Ontario wolves
3. Algonquin-type wolves (from Great Lakes-St. Lawrence Forest outside Algonquin Provincial Park)
4. Algonquin wolves (from Algonquin Provincial Park, 1964-65)
5. northern transition wolves (between Boreal-type and Algonquin-type)
6. southern transition wolves (between Algonquin-type and coyotes), and
7. southern farmland coyotes.

A sample (n = 15) of animals from the captive *Canis* hybridization (Kolenosky 1971) is included. This sample will be used to define population relationships and, based on differences identified, current samples will be collected and tested against the historic results. An initial comparison can be made with the sample Theberge collected in recent years in Algonquin Provincial Park and in the adjacent Frontenac axis and Magnetewan areas. It is expected that further samples from other areas will be important to determine changes in Ontario *Canis*. However, the location of

> "The key role
> of wolves in the ecosystem, …
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> to be sustained …."

new sampling should be determined on the basis of the historic baseline results. Future work could be conducted by a graduate student and involve comparison between current and historic samples. In addition, OMNR and the World Wildlife Fund Canada are supporting research by David Pennock of Fort Hays State University, Kansas, to analyze the morphological variation of the historical sample provided for the genetic work.

RELATIONSHIP BETWEEN TAXONOMY, CONSERVATION PLANS AND ADAPTIVE MANAGEMENT PLANS

The key role of wolves in the ecosystem, whether in Algonquin Provincial Park or in northern Ontario as a whole, means they must be managed in order for the species to be sustained, regardless of their taxonomic status or the results of genetic research. However, genetic work can help us focus on particular management strategies for wolves by defining the extent of populations and the degree of hybridization among wolves and coyotes. For example, coyote introgression may be addressed with habitat considerations; exploitation concerns may be managed with harvest regulations; and migration patterns may be considered through deer management.

The management of wolves in and around Algonquin Provincial Park involves many ecological, social, political and economic issues. Resolution of these issues is unlikely without an adaptive management plan. Adaptive management requires the participation of a variety of interests in a compliance-building process of (1) agreeing on what is known, (2) developing alternative hypothesis and management actions, (3) implementing and testing, and, eventually, armed with new knowledge, (4) agreeing on changes in strategy. Other approaches have been slow to change plans. The genetic studies were initiated with the understanding that they can improve and refine the decision-making process: historical samples can provide a valuable baseline, and the current and future collections can determine how systems are changing. Much important ecological work has already been done, including the recent work by Theberge et al which identified a variety of factors that regulate and limit Ontario wolves in general and Algonquin Provincial Park wolves specifically.

COSEWIC AND COSSARO AND THE STATUS OF *CANIS LUPUS LYCAON*

The taxonomic work to date, based on both morphology and genetics, presents an unclear and changing picture of wolves. While it is easy to accept that *Canis l. lycaon* is a special wolf in Ontario ecosystems, its distribution, status as a subspecies and relationship with historic populations are not known. The "lines" among subspecies, including those defined by Nowak (1995), are often only guesswork. Preliminary genetic results from B. White and P. Wilson suggest a unique status for *C. l. lycaon*—a view that is quite different from those held only one year ago.

Conservation plans to ensure the sustainability of wolves in Ontario can move forward without a change in the status of wolves by either the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or the Committee on the Status of Species at Risk in Ontario (COSSARO). The taxonomic studies described above are a major step towards resolving taxonomy questions and have the potential to provide a firm basis for evaluating the status of *C. l. lycaon* in Ontario.

CONCLUSION

Concurrent with new advancements in science, there is increasing international, national and provincial interest in the conservation of large carnivores. At the local level, many communities remain polarized over the intrinsic and extrinsic value of wolves. There have been few changes in the regulatory status of wolves in Ontario in recent years. Consequently, OMNR recently completed a report entitled *A Review of Wolf and*

Coyote Status and Policy in Ontario (Buss and de Almeida 1997) that includes recommendations for policy and management changes. Both regulatory and educational efforts will be important parts of any new conservation effort concerning wolves.

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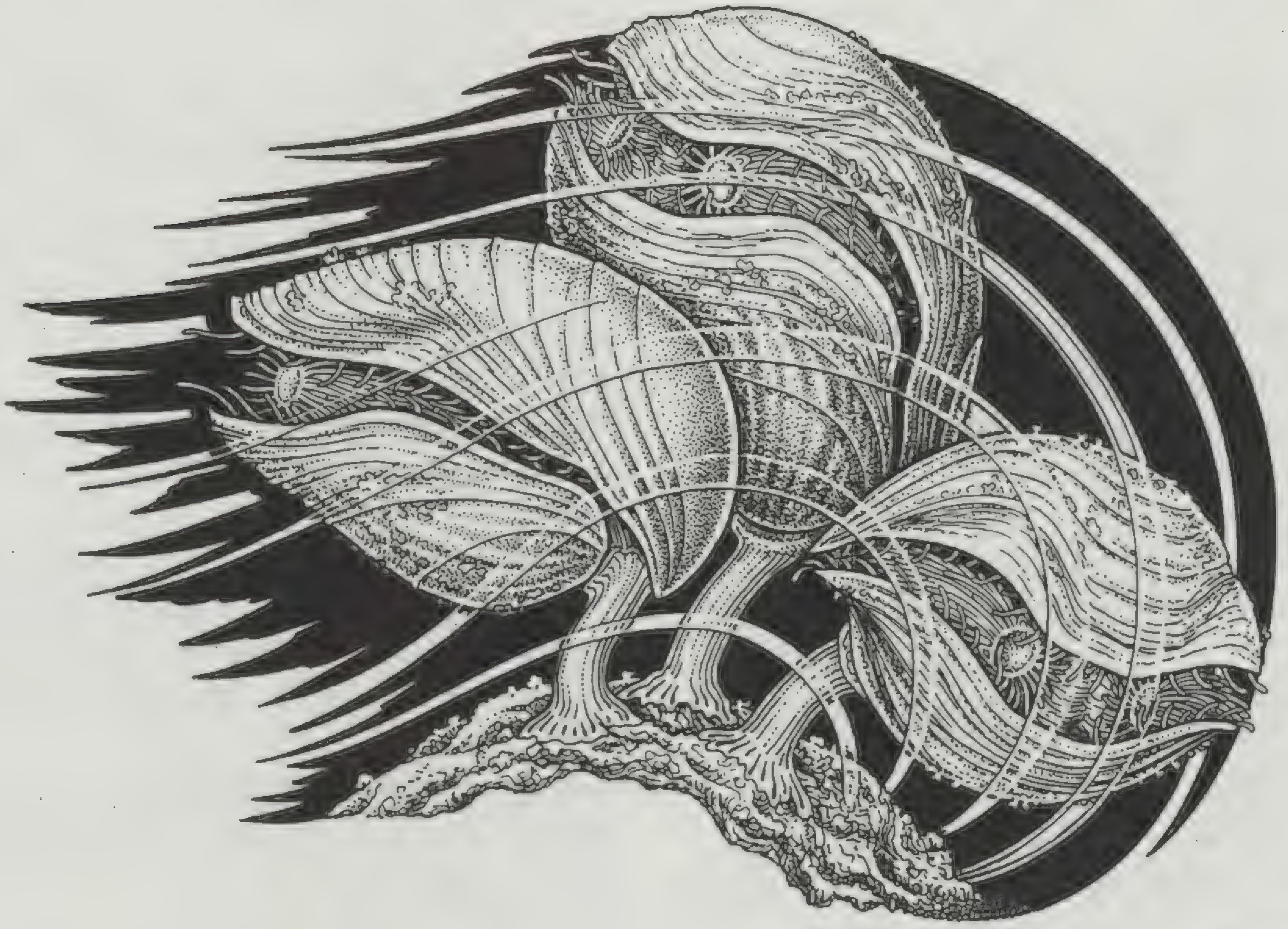
The Lamp Shells

Phylum Brachiopoda



Terebratulina sp. is a typical articulate brachiopod. It usually lives in offshore waters on stalks that adhere to rocks with the shells hanging free in the water, sometimes in clumps. As it is an articulate, the shell is calcified, and the lophophore (visible through the opening) is supported by a skeletal frame.

Illus.: Roelof Idema

The lamp shells of the *phylum Brachiopoda* are living fossils of a group that goes back at least 600 million years. Only about 335 living species are known, while 30,000 fossil species have been described. Lamp shells are strictly marine (no freshwater species are known) and occur on the bottom from the intertidal zone to 4 kilometres in depth. Most species measure 4 to 6 cm across the broadest part of the shell, but some are as small as 1 mm and others as large as 9 cm. Rich in species in the Paleozoic period, the group has declined since that time, perhaps because of competition with bivalve molluscs. The hard and distinctively shaped shells of the *Brachiopoda* make them useful to geologists in dating older strata.

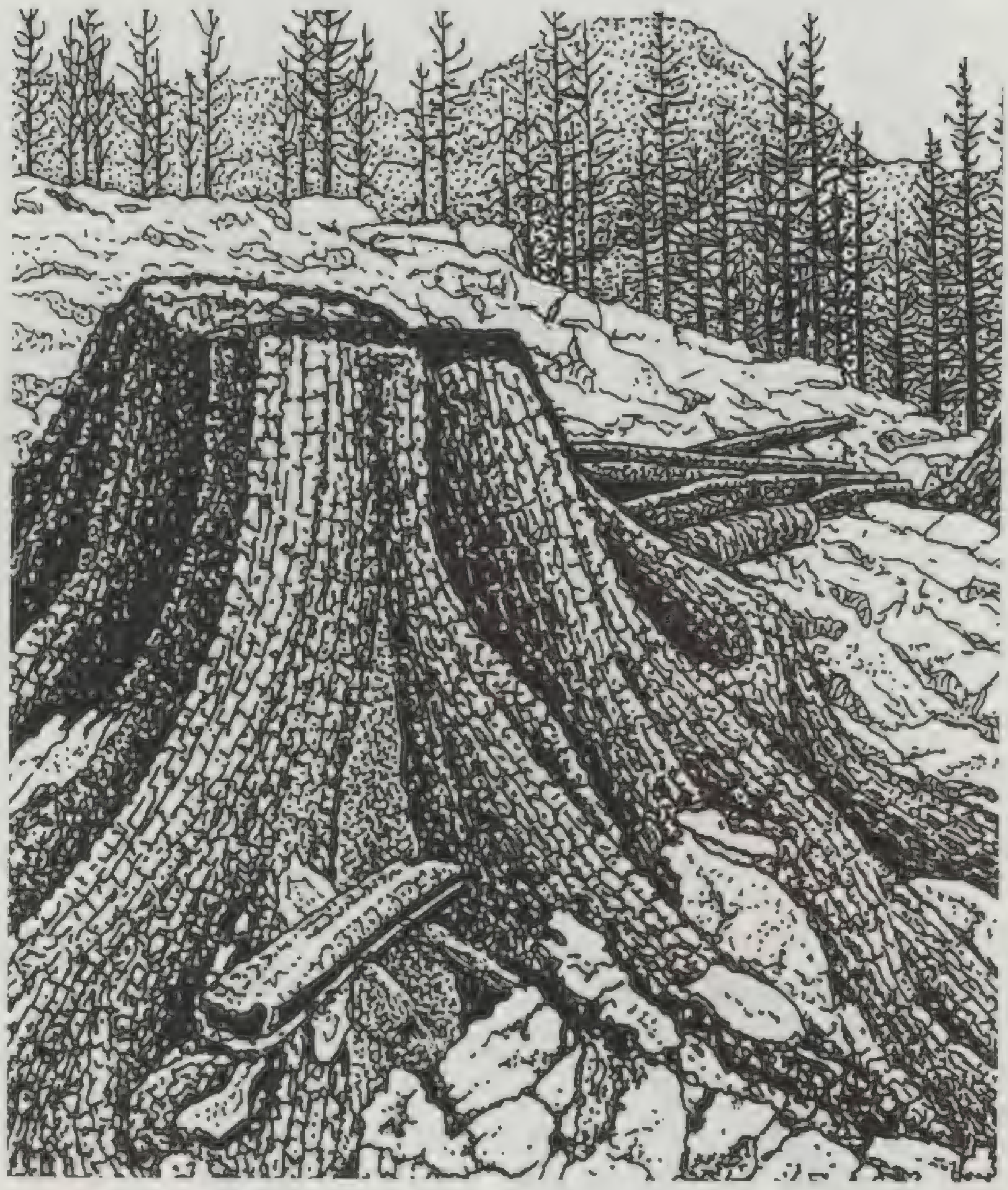
The lamp shells are so named because they look like Aladdin's Lamp (from the novel *Arabian Nights*); the shell representing a saucer full of oil and the stalk, a wick. With a pair of shells the *Brachiopoda* resemble bivalve members of the *phylum Mollusca*, such as clams and scallops. But closer inspection reveals the stalk, or peduncle, exiting through a hole in the larger, lower shell, and a smaller upper shell, whereas most bivalve molluscs have two shells equal in size. The peduncle enables the lamp shell to attach itself to the bottom. Inside the shells, food gathering tentacles are arranged in a spiral or circular structure called the lophophore. A few lamp shells are used as food. But mostly they are of interest because the few surviving species represent stranded relicts of an ancient past and provide a clock for geologists.

D.E.M.

BIODIVERSITY NEWS

NEW ESTIMATES PLACE INDONESIAN FIRE DAMAGE AT $4.4 BILLION

A study released in Singapore in May of this year places total damages for the 1997 Indonesian forest fires at more than US $4.4 billion. According to David Glover, Director of the Economy and Environment Program for South East Asia (EEPSEA), "[t]his is more than the damages assessed for the Exxon Valdez oil spill and India's Bhopal chemical spill combined. The resources lost would have been more than enough to provide basic sanitation, water and sewage services for Indonesia's 120 million rural poor." Fires and haze affected 5 million hectares in Indonesia and 70 million people throughout the region. The authors point out that the figures are conservative, and do not take into account loss of life, possible long-term health effects, or the full value of lost biodiversity. A summary of the report, including detailed figures and estimation methods, can be seen on the EEPSEA web page housed on the International Development Research Centre's website at: <http://www.idrc.org.sg/eepsea>.



Illus.: Roelof Idema

MACMILLAN-BLOEDEL MOVES AWAY FROM CLEAR-CUTTING

MacMillan-Bloedel Limited, one of the largest forest product companies in Canada, has announced it is moving away from clear-cutting over the next five years. Tom Stephens, president of the corporation with annual sales exceeding $5 billion, announced the company will phase out clear-cut harvesting in all of its British Columbia operations and pursue a new stewardship strategy which focuses on old-growth and habitat conservation. The plan establishes three stewardship zones. The company will move to variable-retention logging; this leaves portions of the original forest in amounts that vary depending on the area being logged. The moves by MacMillan-Bloedel have been welcomed by Elizabeth May of the Sierra Club of Canada, author of the recently published *At the Cutting Edge*, and by Karen Mahon, veteran Greenpeace forests campaigner, who presented a bottle of Dom Perignon champagne to corporation president Stephens. [Condensed from <http://www.mbltd.com/forestproject/intent.htm> and *The Ottawa Citizen*].

Seafan or gorgonian
Illus.: Roelof Idema

FISHING GEAR MOWS DOWN CANADA'S OLD-GROWTH CORAL GROVES

Corals and seafans, some at least five centuries old, are being sheared off by mobile fishing gear in Canadian waters. This breakage is happening faster than they can grow back, as research on aging has just discovered. Dr. Michael J. Risk, a professor at McMaster University in Hamilton, has aged a moderate-sized seafan or gorgonian, known as the "red tree coral" (*Primnoa resedaeformis*), taken off southern Nova Scotia between Georges and Browns Banks [see: *Sea Wind*, Ottawa 12(1):1-21]. With a trunk diameter of 5 cm (2 inches), isotopic dating by Risk's lab showed the specimen to be 500 years old. With specimens of other seafans reported up to 30 cm (1 foot) in diameter, the age of some specimens is possibly over 1,000 years old.

The seafans and other coral-like species are most common on rocky areas at the edge of the continental shelf, at 200 m depths and greater, and in the canyons on the shelves. Because of constant trawling activities on the continental shelves, it is not known whether seafans occurred at one time on isolated rocks or smaller rock outcroppings of the shelves. Seafans branch into fan-like or tree-like forms, bearing 8-tentacled polyps that look like tiny flowers when opened. They appear as orange, red, brown or black, and some seafans are luminous. The corals provide food and shelter for many invertebrates and fishes. Commercial fishes are so common in and near these ecosystems, that fishers use longline, gillnet and dragging gear despite the risks of damage to the gear on the rocky bottoms.

Destruction of coral groves can be expected to affect biodiversity. The coral is valuable because a number of tropical seafans contain compounds that have the potential to treat cardiovascular disease, asthma, ulcers and infections. Dr. Risk's research demonstrates other uses of sea fans: growth patterns give researchers clues to how deep-water temperatures changed at the end of the last glaciation. But one wonders how many of these marvelous time machines are now left for future research. For more information, consult Heather Breeze's *Distribution and Status of Deep Sea Corals off Nova Scotia* (Ecology Action Centre, Halifax, 58 pages). [DEM]

ENVIRONMENTAL CHOICE TURNS 10

One of the world's first, and most successful, eco-labelling programs is celebrating its tenth year. Environmental Choice Program (ECP) was developed in 1988, as the world's second eco-labelling program, and the first to require third-party verification of products that bear its identification symbol: the EcoLogo. Today there are over 25 such programs around the world, yet the ECP is still an internationally recognized leader in terms of market penetration and operating procedures. [Condensed from *Let's Talk Green*, Environment Canada, July/August 1998]

COSEWIC DECLARES CANADA'S ATLANTIC COD VULNERABLE

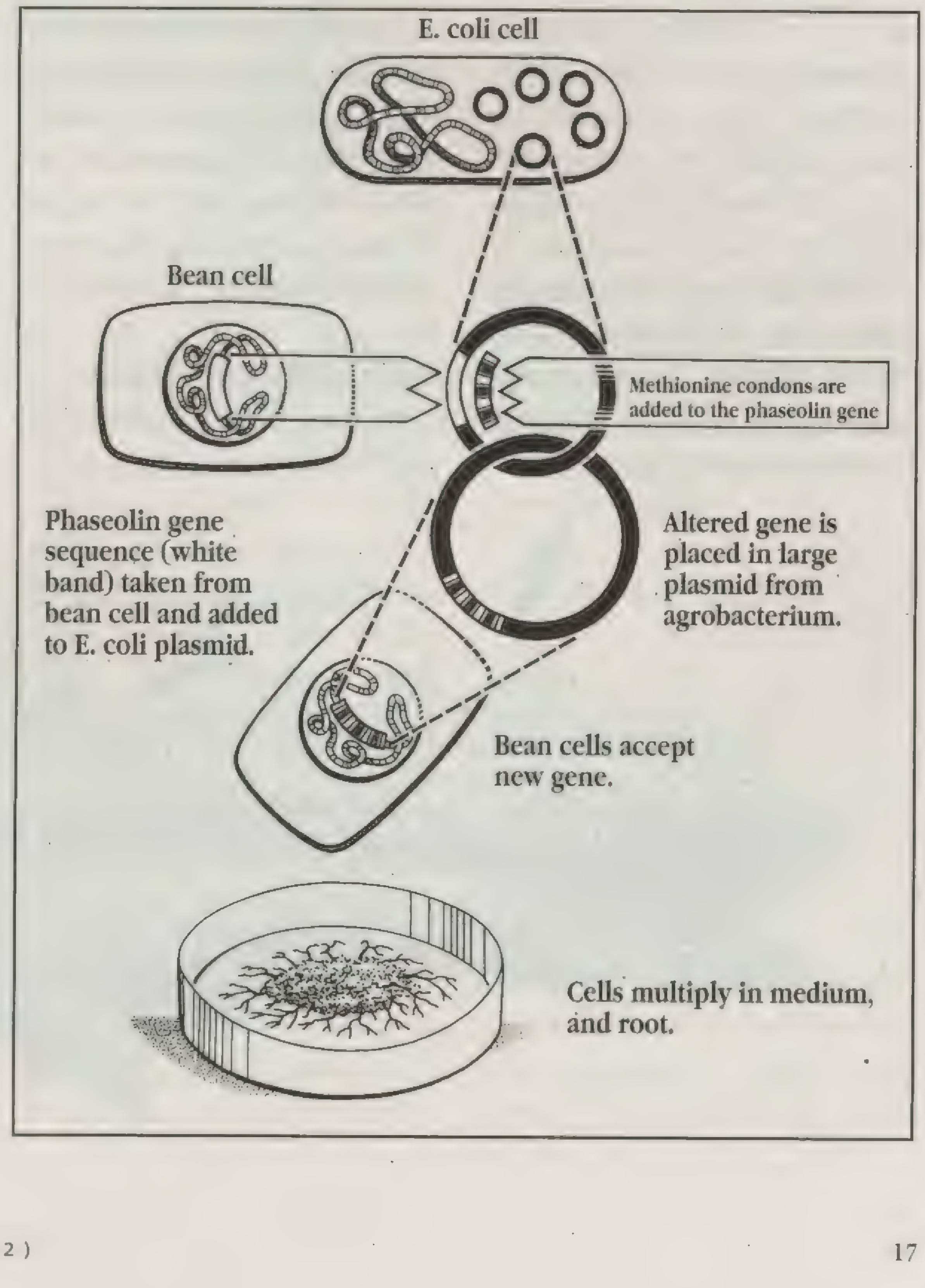
The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) declared the Atlantic cod (*Gadus morhua*) populations of Canada to be vulnerable. Vulnerable status is one step before the threatened status, which is itself just before the endangered category. COSEWIC stated the Atlantic cod experienced significant declines during the last decade over large areas of its range without appreciable recovery, despite moratoria on fishing.

SURINAME TO ESTABLISH VAST RAIN FOREST PRESERVE

Lying between Guyana and French Guiana in northeastern South America, Suriname has large tracts of virgin rain forest rich in species. The Suriname government had been considering bids by Malaysian and Indonesian logging companies to exploit these forests for timber. Instead, the government has chosen to reverse this policy and accept the proposal of Conservation International, a large environmental organization, to establish the Central Suriname Wilderness Nature Reserve. This will protect 16,000 km^2 of forest, almost 10% of the country's area. Conservation International has secured private funding for a $1 million trust to cover management costs of the newly protected area. This will help Suriname develop a strategy for conservation based on non-timber forest products, agroforestry and ecotourism. Suriname has a tiny ecotourism industry. This proposal will allow the industry to expand, providing a steady flow of currency into the country and creating sustainable employment. For information on the effects of tropical timber logging and its sustainability in nearby Venezuela, see an article by Julio Cesar Centeno in *Global biodiversity* 5(4). [DEM]

BRITONS REJECT ENGINEERED FOODS

Seventy-seven per cent of the public in Britain believe there should be a ban on growing genetically engineered crops and food in Britain. A similar number (73%) are concerned that genetically engineered crops could interbreed with natural, wild plants and cause genetic pollution. The recent MORI poll also reveals that 61% of the public do not want to eat genetically modified foods (an 8% increase over a similar poll conducted in December 1996) and 58% oppose the use of genetic engineering in the development of food (a 7% increase since 1996). As of next year, herbicide-resistant oilseed rape could be the first genetically engineered crop to be grown commercially in Britain. A GeneWatch report, "Genetically engineered oilseed rape: agricultural saviour or new form of pollution?" concludes that new research casts doubts on previous safety assessments and that serious damage could be done to the environment and farming. "How much more evidence does the government need that the public does not want genetically engineered foods and that this opposition is increasing?" asked Dr. Sue


E. coli cell
Bean cell
Methionine condons are added to the phaseolin gene
Phaseolin gene sequence (white band) taken from bean cell and added to E. coli plasmid.
Altered gene is placed in large plasmid from agrobacterium.
Bean cells accept new gene.
Cells multiply in medium, and root.

The illustration demonstrates the insertion of a missing amino acid, methionine, into a bean cell using bacterial plasmids (rings of DNA) as working tools.

Engineering plants
Illus: Roelof Idema

Mayer, director of GeneWatch, the independent organization monitoring developments in genetic engineering and study author. "Until now, the government has taken little account of public opinion and has been complacent about the risks of introducing genetically engineered crops."

MARINE PARKS PLANNED IN QUEEN CHARLOTTE ISLANDS

The Canadian federal government has introduced legislation to create marine parks in coastal waters and freshwater parks in the Great Lakes. The long-term objective is to create marine parks in each of 29 representative marine areas, according to Andy Mitchell, Secretary of State for Parks. The first full park to be created will probably be the Gwaii Haanas in the Queen Charlotte Islands on Canada's northwest coast. Earlier this year, four of Canada's oil giants surrendered their exploration rights in the Gwaii Haanas area to the Nature Conservancy of Canada. This area is rich in marine life, and has productive fisheries as well as seabirds, sea lions, killer whales and grey whales. [From the *Vancouver Sun*, 12 June 1998].

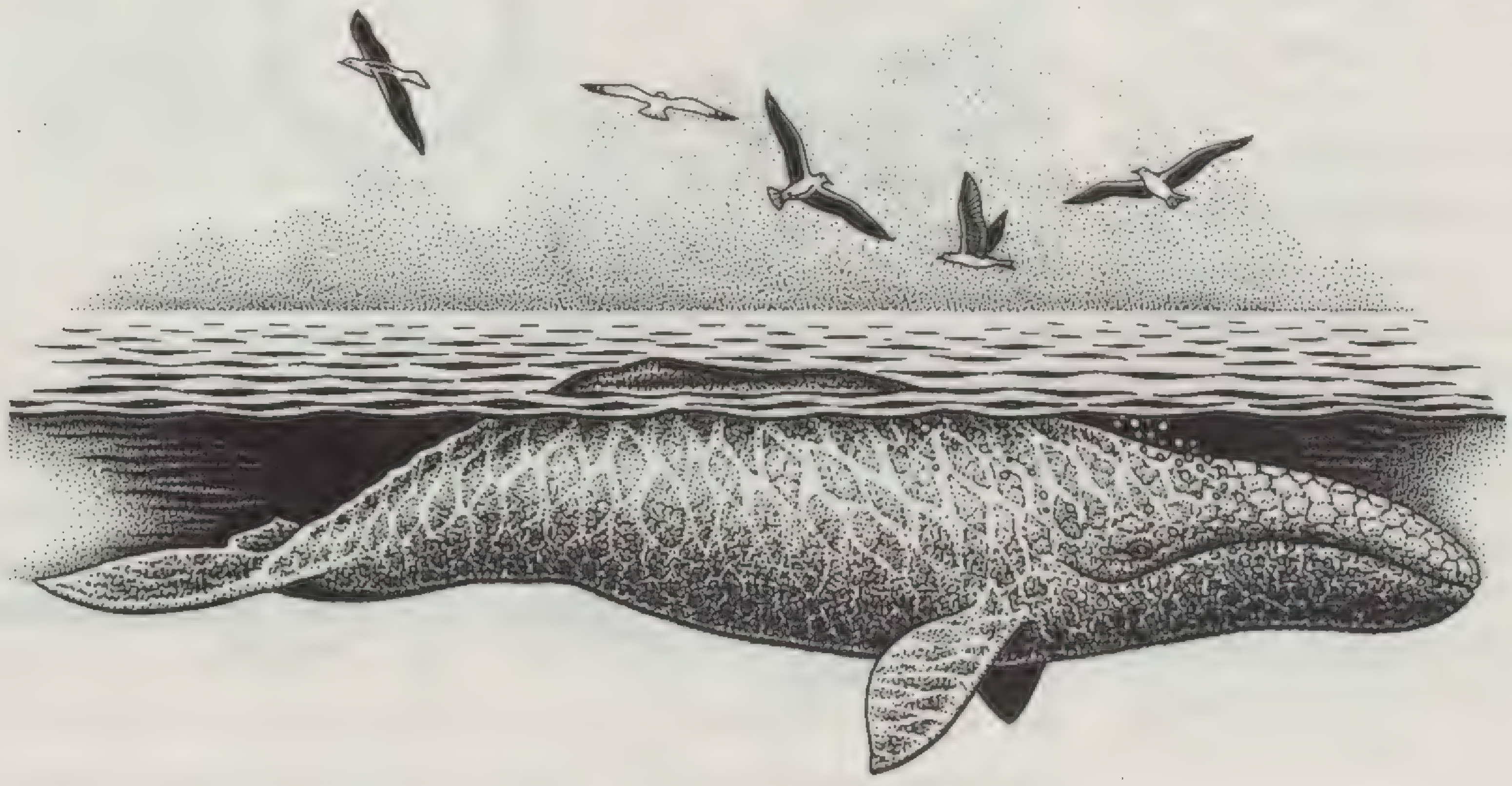
CURBS ON BIO-PIRACY IN INDIA

An independent Indian commission has recommended a comprehensive biodiversity law based on community ownership, with the government acting as a trustee for non-local and commercial trade in biodiversity and traditional knowledge. The People's Commission on Biodiversity, Indigenous Knowledge and People's Rights, established in March 1997, was responsible for studying the loss of India's biological resources as well as the plundering of traditional knowledge by multinational companies. The results of this study will be presented to the government as it makes changes to current patent laws. During hearings in Delhi, the Commission talked with farmers, representatives of the seed industry and tribal groups, as well as scientists, to learn about the impact "bio-piracy" would have on their livelihoods and on the nation as a whole. Hearings will also be held in other parts of India. [Condensed from *The Ecologist*, July 1998]

FAITH AND SUSTAINABILITY

Churches are increasingly concerned with sustainability. A Canadian ecumenical report (*Towards Sustainable Commity: Five Years since the Earth Summit*) reviewed issues on climate change; forests; mining; biodiversity; gender equity; globalization, trade and trans-national corporations; aboriginal issues; agriculture and oceans. Under biodiversity, the churches recommended that Canada should:

- press to recognize the rights of indigenous peoples and developing countries to the genetic riches of the world's biological diversity;
- support limits to intellectual property rights when those rights compromise the traditional use of natural biological diversity;
- assess biotechnologies on the basis of their potential to contribute to long-term healthy relationships in sustainable communities;
- assure safety of genetically modified organisms before release;
- complete, with the provinces, a system of protected areas; and that
- Canadian churches and congregations should support the preservation of biological diversity through education and advocacy.



Gray whale
Illus.: Roloef Idema

Mangrove swamp
Illus.: Roloef Idema

The Anglican Synod strongly urged the government of Canada, when it negotiates any trade and investment agreement, to undertake full, fair and public hearings including discussions with those most affected. [From reports by the Canadian Council of Churches and the Anglican Synod] [DEM]

HEAD OF SECRETARIAT OF THE CONVENTION ON BIOLOGICAL DIVERSITY TO STEP DOWN

Calestous Juma (of Kenya) has decided to step down as executive secretary of the Secretariat of the Convention on Biological Diversity in October 1998. On 23 July, Juma, who has served in the position since August 1995, informed the executive director of the United Nations Environment Programme (UNEP), Klaus Toepfer, that he will not seek another term of office for personal reasons.

GREENPEACE ACTS TO PROTECT REMAINING MANGROVES IN ECUADOR

Ecuador's Minister of Environment has promised Greenpeace that she will take steps to secure a permanent ban on mangrove clearcuts by the country's shrimp farming industry and investigate evidence of illegal mangrove destruction in a protected national reserve. In a meeting with Greenpeace, Minister Flor Maria Valverde also agreed to confront the Ecuadorian Forestry Institute of Natural Areas and Wildlife (INEFAN) over evidence of 745 cases of mangrove destruction by shrimp farm operators that were lodged with it by the local environmental organization Fundecol since 1989. Only four cases were investigated. Greenpeace staff onboard the Rainbow Warrior were invited to Ecuador by Fundecol to highlight the widespread and illegal destruction of mangrove forests by the shrimp aquaculture industry. The destruction of mangrove forests by shrimp farming interests has been illegal in Ecuador since 1994. [Condensed from Greenpeace website: <http://www. greenpeace.org>]

100 NATIONS HAMMER OUT BIO-ENGINEERING TREATY

Protesters have been pulling up genetically engineered crops across the UK and in other European countries where governments have banned the planting of these biotech crops. In August, the United Nations Environment Programme (UNEP) hosted international treaty talks to nail down global controls over living modified organisms (LMOs) produced by biotechnology. Officials from over 100 governments met in Montreal from August 17 to 28 for the fifth meeting of the Open-ended Ad Hoc Working Group on Biosafety. The new agreement will address the safe transfer, handling and use of LMOs that may have adverse effects on the conservation of biological diversity.

"Biotechnology can contribute to global food security, improved health, economic growth and other essential human goals," Klaus Toepfer, UNEP executive director said from UNEP head-quarters in Nairobi. In modification of organisms by biotechnology, genes of one species are spliced directly into the genes of another species. Some scientists are working with these methods to clone animals such as mice and sheep. Other

Sheep
Illus.: Roloef Idema

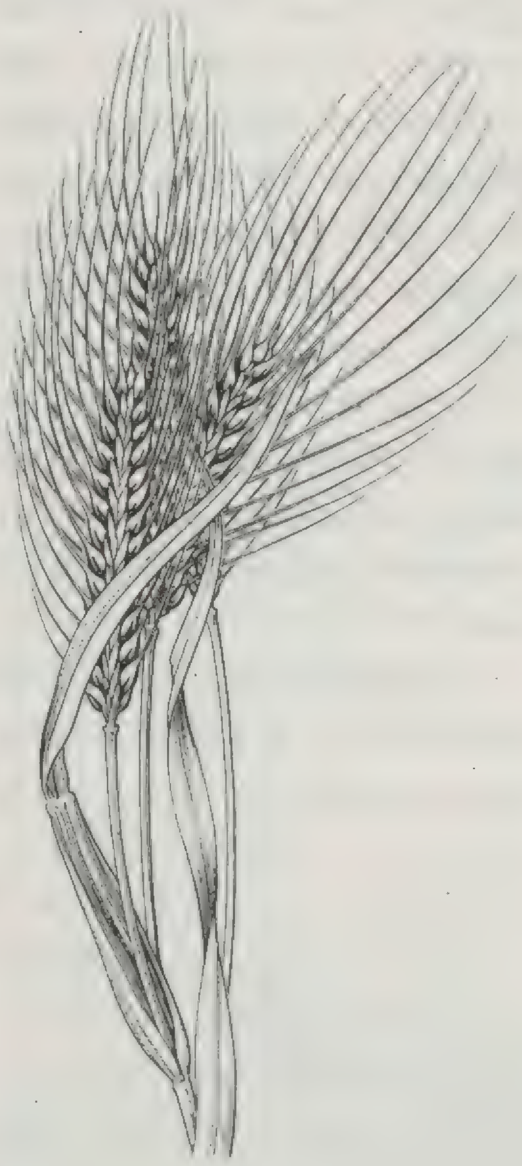
researchers are creating new plants that may be herbicide tolerant or resistant to other chemicals. Consumers around the world are demanding that genetically modified foods be labelled. The most common of these foods are soybeans, corn and canola oil, but some varieties of tomatoes, potatoes and other vegetables have also been modified with biotechnology.

"Since we do not know enough about how these organisms interact with the environment, we need a biosafety regime that does not hinder biotechnology innovations, but also one that can prevent misuse, escapes, and accidents that could have irreversible consequences," Toepfer said.

The Biosafety Protocol is to be finalized at the Working Group's sixth meeting and adopted at an extraordinary meeting of the Convention's Conference of the Parties in February 1999 [Condensed from a report by ENS News at: <http://www.ensnews.com>].

ORGANIC FOOD AND FARMING RULES TO BE RE-WRITTEN

The US Department of Agriculture (USDA) proposed new standards governing the production and labelling of organic food and fibre.



Barley
Illus: Roelof Idema

The US Congress instructed the USDA to implement the National Organic Program with rules consistent with the Organic Foods Production Act of 1990 and the principles of organic farming and handling. However, ordinary citizens and organic farmers found the newly proposed organic rules fell short of standards embraced for many years by certified organic farmers and expected by consumers in the marketplace. The proposed rules included items on violating the prohibition of the use of synthetic medicines, antibiotics and parasiticides on livestock, poultry and dairy animals; the use of certain additives in food processing; and enabled the use of synthetic pesticides and biosolids (sewage sludge) that could contain contaminants on crops.

The negative public response resulted first in extending the deadline for comments and, ultimately, the withdrawal of the proposed new rules. The USDA is now working on a new set of rules for the National Organic Program. [Condensed from <http://www.pmac.net/nosrule.htm>].

FORUM

The power of seeds

Sharon Rempel, BSc Agriculture, MA Conservation Studies

In the spring of 1997, I was invited to participate as a member of the Canadian Delegation on Plant Genetic Resources to the United Nations (UN). I learned of many important international issues that all Canadians, whether farmers, gardeners or consumers, should consider.

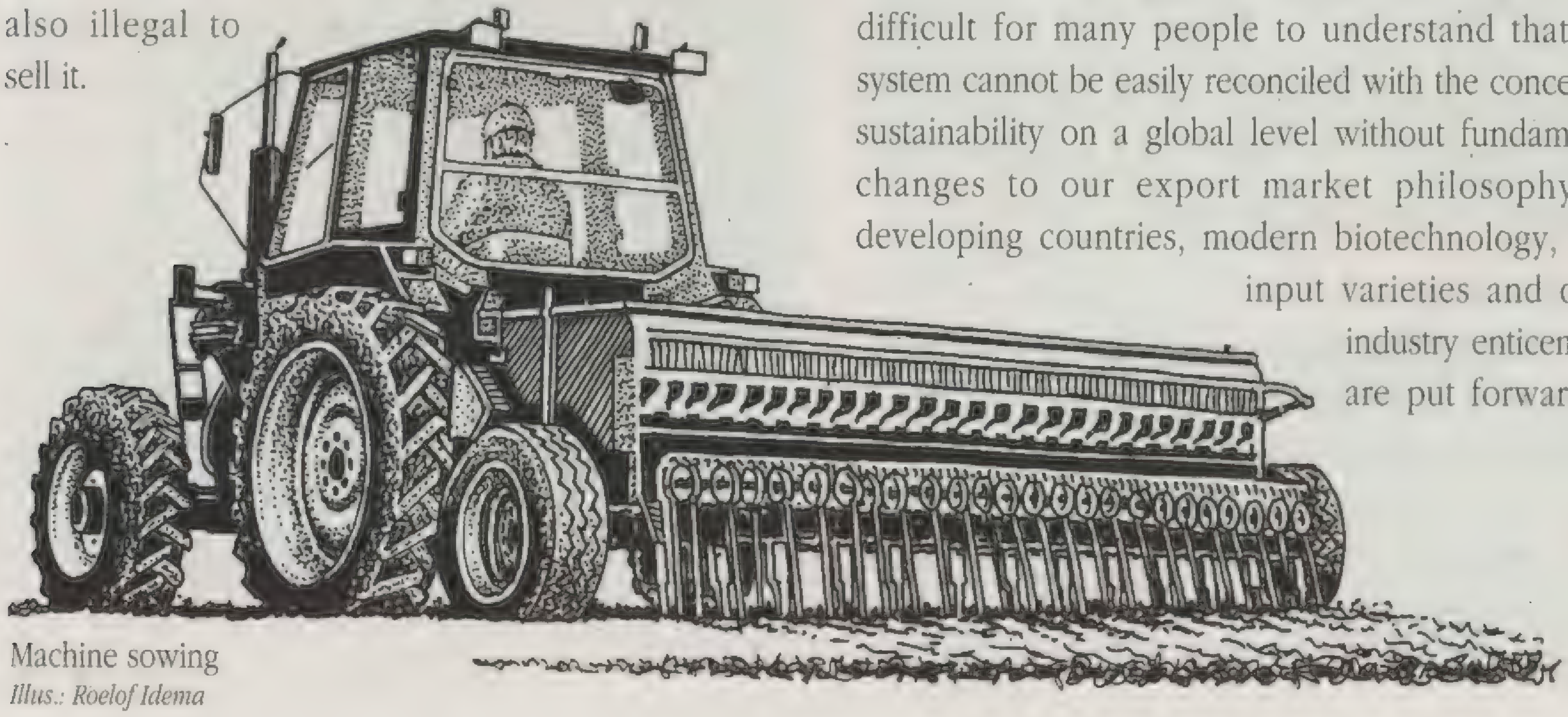
The issue of farmers' rights is now on the agenda at the UN, but Canadian policymakers still struggle with this concept. To me, it is an issue of human rights. Farmers in India rioted when their government restricted their choice of seed and prohibited them from growing their traditional varieties. The European Union tried to pass a law that would have made it illegal for farmers to save and sell their own seed. These are not isolated incidents. In Canada, farmers' rights should be considered on many levels, including the right to choose which variety of crop to grow. At this time, the Seeds Act regulations prohibit a farmer from selling varieties that are not licensed. Therefore, it is illegal to sell Canadian heritage varieties of wheat such as Red Fife dating from the 1880s. If a variety has been deregistered, it is also illegal to sell it.

Many organic farmers find this regulation very restrictive as the modern, and legal, varieties are better suited to high input farming systems rather than to their organic systems. Furthermore, many museums wish to grow and sell old varieties as living artifacts, but are prohibited from doing so. One way to resolve this problem of suitability would be to have a parallel registration system in place for the currently restricted heritage or traditional varieties.

The Seeds Act in Canada reflects seed industry recommendations. Registration criteria are stringent and are based on modern agronomic values such as high yield, uniformity and disease resistance. These criteria are useful for varieties geared to the export-driven market, but they do not help to maintain agricultural biodiversity.

In February 1997, the Prairie Regional Registration Committee met in Edmonton to discuss seed varieties that would be put forward as the year's recommendation for registration. No mention was made of the heritage or traditional variety issue.

The Canadian agricultural system was set up in the 1880s as a colonial export economy. Monoculture developed with machinery evolution, and the prairies were cultivated to grow more grain for export. It is difficult for many people to understand that this system cannot be easily reconciled with the concept of sustainability on a global level without fundamental changes to our export market philosophy. In developing countries, modern biotechnology, high input varieties and other industry enticements are put forward by



Machine sowing
Illus.: Roelof Idema

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Sunflower seeds
Illus.: Roloef Idema

the developed nations. These often result, however, in the displacement of people from the land as well as the loss of traditional and indigenous plant varieties and biodiversity in the field.

The Canadian Biodiversity Strategy states as a policy that it is important to encourage farmers to maintain the diversity of agricultural crops in the field. Obviously, farmers cannot afford to grow a variety of seed that is illegal to sell. Little research has gone into evaluating the merits of taste, gluten quality or other seed qualities of the old varieties. Researcher Pierre Huel of Saskatoon found that some old varieties had nitrogen-fixation capabilities. Further study could reveal whether these varieties might contribute to soil fertility in low input farming systems.

There is a large gap between government and non-governmental organization (NGO) philosophies of conservation. In the federal government, Environment Canada is afraid to touch agriculture issues such as gene banks, seed conservation and biodiversity of crop plants. Agriculture and Agri-Food Canada shows little interest beyond policy issues such as farmers' rights, field enhancement, low input agriculture and national food security. Canada spends a great deal of money helping the developing countries and exports our answers to their problems in the form of biotechnology, agri-business and biodiversity conservation. Yet, it is difficult for non-governmental organizations and others to find money to do biodiversity work in Canada, as most money is targeted for biotechnology, agri-business and the two major export crops, canola and wheat (both high input).

Most people are unaware of the lack of funds and the stringent regulations in agriculture. GATT, the World Trade Organization and other trade agreements have encouraged homogeneity and globalization of the food system. There is little financial support for, and legal enforcement of, diversity conservation efforts. There is some interest in maintaining biodiversity for the benefit of breeders and the biotechnology industry, but support for an old variety is rarely considered worthwhile. Furthermore, we know that human societies use a variety of plants for their food, spiritual practices, housing, medicines and fibres; yet, this expression of cultural diversity is not considered when determining the value of a plant for conservation purposes.

It is important to find out the facts and then voice your concerns to the people who make decisions in this country. Most Canadian politicians and bureaucrats are not aware of the issues. Education on these issues is therefore vital. It is important for all Canadians to understand that the hand that controls the seed, controls the food supply. I work to keep the seeds in the hands of people. You can support heritage plant and animal conservation efforts locally and nationally in many ways, such as by growing some open pollinated seeds and keeping the varieties alive. For information on the grain registration issue, contact: Grant Watson, Seeds Division, Agriculture Canada, 59 Camelot Drive, Nepean, ON K1A 0Y9 or Bob Morgan, Saskatchewan Wheat Pool, 201-407 Downey Road, Saskatoon, SK S7N 4L8. For information on biodiversity conservation, contact: John Herity, Director, Biodiversity Convention Office, Environment Canada, 351 St-Joseph Blvd., Hull, QC K1A 0H3. For information on seed conservation, contact: Seeds of Diversity, Box 36, Station Q, Toronto, ON M4T 2C7, and for animal genetic conservation, contact: Rare Breeds Canada, General Delivery, Campbellford, ON K0L 1L0.

SUCCESSES & INITIATIVES

UNIVERSITY RESEARCHERS TRACK RARE SEABIRD

Marbled murrelets, scooped out of the sea in the dead of night and fitted with radio transmitters, have led wildlife researchers to 21 nests in old-growth forests north of Powell River, British Columbia. "This is just an incredible finding. It's the biggest sample of active nests ever found anywhere," says Fred Cooke of Simon Fraser University (SFU), who heads the $1 million Marbled Murrelet Project in Desolation Sound. It has a helicopter in the air and 16 scientists and students on the ground tracking the elusive birds.

"We were hoping we'd find one nest, and we end up finding 21," says Cooke, who also chairs SFU's wildlife ecology group. "It's an incredible breakthrough." Finding nests—and understanding the birds' needs and habits—has been painfully slow because they are so discreet, flying many kilometres inland to tend their eggs and chicks hidden on the mossy branches of ancient trees. Murrelets are the only seabirds that nest in old-growth trees. They lay only one egg each year.

Though thousands of marbled murrelets live on the British Columbia coast, the first nest was not discovered until 1990. The first active nest complete with a chick was not spotted until 1993. There have been about 40 nests found since then, but almost all of them have been empty. Cooke's enterprising research team has used a combination of sneaky bird-catching tricks and technology to find the 21 active nests this year. They snuck up on murrelets dozing at sea at night and scooped them into their boats with dip nets. Then they fitted tiny radio transmitters on 40 of the birds and anchored the transmitters under the bird's skin. "It sounds a bit grisly," Cooke says, but quickly adds that there's no evidence the devices harm the birds. Since fitting the birds with transmitters in May, the researchers have been tracking them by helicopter and boats. They sweep Desolation Sound daily for signals from the birds' transmitters.

Haliburton Forest Canopy Walk at 20 metres up.
Photo: Don McAllister

The helicopter is the key to their success, says Cooke, adding that MacMillan Bloedel and four other forest companies are paying for the aircraft that's out at dawn each day monitoring the birds as they zoom to and from their nests. The project in Desolation Sound, where researchers have taken DNA samples of some murrelets and banded more than 1,000 birds, is due to run for another two to three years. [Condensed from *Vancouver Sun*, June 18, 1998]

CANOPY WALKWAY LIFTS MIND AND BODY

A forest canopy tour takes nature lovers up into the tops of white pines on a narrow boardwalk in the Haliburton Forest of Ontario. The tour, called "A Walk in the Clouds", is part of a four-hour guided hike that includes a visit to the tops of a stand of old-growth white pine. The boardwalk is suspended 20 metres

Old-growth forests can generate financial return from elevated walking tours.
Photo: Don McAllister

(66 feet) above the forest floor. Guide ropes on either side of the boardwalk serve as handholds and support suspended loops that hold the floating floorboards.

Haliburton Forest is comprised of 124,000 hectares (50,000 acres) of rolling hardwood forests and conifers near the southern edge of Algonquin Provincial Park. The forest is privately owned and is also used for outdoor education, camping, mountain biking, fishing, canoeing, snowshoeing, skiing and hiking. The many activities in this privately owned area show that old-growth forests can generate a financial return by maintaining, rather than clear-cutting, the land. Individuals are willing, for example, to pay $65 each for the elevated walking tour. As this issue went to press, 200 individuals were reported to have taken the tour in its first few months.

Canada's Biodiversity included an estimate that there were 500 to 600 yet undiscovered species in the canopy of the country's West Coast rain forests. One wonders how many species remain to be discovered in Ontario's old-growth forests. These forests can provide long-term returns to local communities (instead of a one-time return every century) when options such as canopy tours, forest floor harvests and ecological services to sustain fisheries and water flow are considered. To find out more about the tour and other activities, contact the Haliburton Forest and Wild Life Reserve Ltd.: Tel.: (705) 754-2198; Web: <http://massnet.com/hfginf.htm>; E-mail: <halforest @halhinnet.on.ca>.

BIODIVERSITY SCHOLARS INITIATIVE LAUNCHED BY 17 UNIVERSITIES

The "ICI/Environment-Scholars Initiative" (or ICI-E) is a new program to support individuals conducting research on issues related to the implementation of the Convention on Biological Diversity (CBD). In conjunction with the Secretariat of the Convention on Biological Diversity in Montreal, the ICI–E is a consortium of 17 Quebec universities to promote environmental research and development.

The Scholars-in-Residence program grants fellows access to documentation, staff and activities of the CBD Secretariat, as well as to all universities participating in the program, along with full office privileges at the University of Quebec in Montreal (UQAM). Scholars-in-residence will normally be appointed for a period of nine months or less, and priority is given to those working on issues related to the program of the Conference of the Parties of the CBD. Scholars are expected to give at least one presentation on their research to the Quebec scientific community. Though the program is seeking funding support for these positions, at present scholars are expected to be self-financed. The selection of applicants is decided jointly by the Observatoire de l'Écopolitique internationale of UQAM's Institute of Environmental Studies, in cooperation with the CBD Secretariat.

Applicants should provide a statement of their research interests including their anticipated benefits from the program, a curriculum vitae and list of publications if applicable. Fluency in French and/or English is necessary. For more information, contact: Observatoire de l'Écopolitique internationale, ICI/E Biodiversity

Scholars Program, Institute of Environmental Studies, University of Quebec at Montreal, PO Box 8888, Station Centre Ville, Montreal, QC H3C 3P8 / E-mail: <le_prestre.philippe@uqam.ca> or <reveret.jean-pierre@uqam.ca>.

POLITICIAN WANTS BARGAIN SHOPPING TO BE ENVIRONMENTALLY FRIENDLY

Imagine going to the store and finding that the most environmentally friendly products are the least expensive. If a product is produced and can be disposed of causing minimal or no damage to the environment, the product costs less. Shopping for a bargain could take on a whole new meaning!

Canadian Member of Parliament Joe Jordan (Leeds-Grenville in Eastern Ontario) is working on a Private Member's Bill that would require the full cost of products to be included in their price. "It's not in society's interest to charge only for the direct costs of putting goods on the market," he says, "If the production and disposal of goods creates problems, it is unjust to expect taxpayers to pay for the environmental correction, and it's immoral to leave problems for future generations."

The proposed legislation is called the "7th Generation Bill" after the Native tradition of considering the interests of seven generations in their decision-making. In addition to instituting full-cost accounting, the bill will outline a comprehensive way to measure monetary activity. The present measure—gross domestic product (GDP)—adds up all the money transacted over a given period of time. GDP as a measuring standard presupposes that any use of money increases a society's well-being.

To improve on the GDP measure, the "7th Generation Bill" would require accounting for reduced soil fertility and loss of forests in a fair balance with credits gained from producing food, lumber and paper. Medical expenses for avoidable illnesses and costs associated with family breakdown would be subtracted from the measure rather than added, and work done voluntarily for families and communities would be recognized as increasing society's well-being. In this way, MP Jordan says, a more accurate picture of society's health and wealth emerges to better determine what programs and policies are needed. For more information, go to: <http://www.cyberus.ca/choose.sustain>.

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CYBERDIVERSITY

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The World Wildlife Fund runs an electronic advocacy network that lets people worldwide help save wildlife and wild spaces through cyberspace-assisted actions. The network was launched in January 1998 and now has 4,000 members from over 80 countries. You don't have to be a member of WWF to join, and the service is free. The cybernetwork allows you to communicate easily and quickly with decision-makers in the USA and internationally. The Conservation Action Network has already assisted in protecting the Galapagos Islands, the Everglades, sea turtles, tigers, rhinos and sharks. Action opportunities involve a mix of US-based and international efforts. Go to: <http://takeaction.worldwildlife.org> to sign up online, or send a blank E-mail to <actionsignup@worldwildlife.org> for an electronic registration form.

Soft coral,
Dendronephyta sp.
Illus.: Roelof Idema

INDIGENOUS KNOWLEDGE MAGAZINE GOES GRAPHIC

The *Indigenous Knowledge and Development Monitor* is now online with graphics. The *Monitor* promotes the exchange of information on indigenous knowledge as it relates to sustainable development and is published three times a year by the Centre for International Research and Advisory Networks (CIRAN) in cooperation with IK Resource Centres. Subscription rate for print version: US $27 annually. Subscribers in Africa, Latin America and Asia may obtain free subscriptions thanks to funds provided by the Netherlands' Ministry of Foreign Affairs, Directorate-General for International Cooperation. Go to: <http://www.nuffic.nl/ciran/ikdm>.

EU DEMANDS EASTERN EUROPEAN COUNTRIES CLEAN UP

The European Union told Eastern European countries they must bring their environment up to the EU's standards if they want to join the union. The estimated cost of cleanup for the 10 Eastern European countries seeking EU membership is close to US $132 billion for compliance with EU environmental requirements. The EU's executive arm (the European Commission) is requiring detailed plans from the states showing how and when they plan to bring their air, water and waste disposal facilities up to code. The EU is providing aid up to US $130 million annually to help the Eastern European states meet these requirements. Go to: <http://europa.eu.int/indexen.htm>. [From *The Gallon Environment Letter* (2)20]

GEOGRAPHERS UNITE!

The website and newsletter of the Cultural Ecology Specialty Group of the Association of American Geographers Group has recently moved to <http://www.brunel.ac.uk/depts/geo> (then follow the links). The group promotes scholarship and networks in cultural and political ecology. Although its origins are in North American geography and anthropology (with a focus on rural, developing country peoples and environmental relations), the membership and range of topics covered are global. Contemporary work in cultural and political ecology includes studies of agrarian change; livelihood systems; prehistory and historical evolution of civilizations; access to resources; land degradation and human impacts on the environment. The newsletter welcomes contributions and announcements. Go to: <http://www.brunel.ac.uk/depts/geo> (then follow the links) or E-mail: <Simon.Batterbury@Brunel.ac.uk>.

US "LIVING CAPITAL"

A study by the US President's Committee of Advisors on Science and Technology on biodiversity and ecosystems is available online. The report entitled *Teaming with Life: Investing in Science to Understand and Use America's Living Capital* discusses public education, the relationship between the economy and the environment, and information systems to share biological knowledge. Go to: <http://www.whitehouse.gov/WH/EOP/OSTP/Environment/html/teamingcover.html>.

DIRECTORY OF ACADEMIC ENVIRONMENTAL PROGRAMS NOW ONLINE

The *Directory of Higher Education Environmental Programs* is available online through the Committee for the National Institute for the Environment. The directory contains detailed information on roughly 60 undergraduate and graduate programs representing the full spectrum of environmental disciplines. Go to: <http://www.cnie.org> and follow the links.

WHAT'S NEW IN ISRAEL

To learn about the latest environmental issues in Israel, contact the Israel Union for Environmental Defense (IUED). A non-profit organization dedicated to protecting the country's natural resources, IUED uses legal and scientific tools to end pollution and prohibit overdevelopment throughout the country. Go to: <http://iued.org.il/eng> [Condensed from *The Gallon Environment Letter* (2)20]

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Singles network

Single science/nature enthusiasts are meeting through Science Connection, a nationwide group. Contact us for information: PO Box 599, Chester, NS B0J 1J0 / Tel.: (1-800) 667-5179 / Web: www.sciconnect.com

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CONFERENCE REPORT

FOURTH MEETING OF THE OPEN–ENDED AD HOC BIOSAFETY WORKING GROUP (BSWG–4), AND THE 4TH CONFERENCE OF THE PARTIES (COP–4) TO THE CONVENTION ON BIOLOGICAL DIVERSITY

DATELINES: MONTREAL, CANADA,
5–13 FEBRUARY 1998
(BSWG–4)

BRATISLAVA, SLOVAK
REPUBLIC, 15 MAY 1998
(COP–4)

REPORTER: GILLES SEUTIN
DEPARTMENT OF
GEOGRAPHY
MCGILL UNIVERSITY

The Biosaftey Working Group (BSWG) of the Convention on Biological Diversity (CBD) met in Montreal in early 1998 to further negotiate an international protocol on biosafety. Biosafety refers to precautionary practices designed to ensure the safe transfer, handling, use and disposal of living modified organisms (LMOs), such as antibiotic-producing bacteria and insecticide-resistant crops, among others. The 350 national representatives of the biotechnology industry and environmental NGOs produced recommendations for the Conference of the Parties (COP) that subsequently met in Bratislava in May of this year.

The push to develop a biosafety protocol comes from concerns over the potential impact on biodiversity of LMOs that could be voluntarily or accidentally freed in the environment. Talks are mainly concerned with the transboundary movements of LMOs, as most other issues are viewed as the responsibility of individual states. Many developed countries are keen to see procedures for exporting biotechnology products clarified and standardized, while developing countries seek transfers of technologies and capacity [see previous BSWG report in *Global biodiversity* 7(3), 31–33].

MODEST PROGRESS DURING BSWG–4

Previous BSWG meetings had resulted in a list of required and potential articles for the future protocol, and delegates were invited to submit legal texts for those articles. The BSWG-4 meeting consolidated options contained in the submitted texts, establishing a common set of terms to clarify divergent positions and identifying common ground for moving forward. As an illustration of the type of progress made, John Herity of Canada, co-chair of Sub-Working Group II, reported that 75 options contained in 15 articles had been analyzed and consolidated into 45 options over 14 articles. BSWG–4 allowed for the elimination of extreme variants in some articles and produced agreements on many technical and procedural matters. However, little progress was made on larger issues, including the scope of the protocol, its procedures and the question of liability and compensation. Opinions on scope still range from a protocol that would cover most biosafety issues, to a protocol concerned only with transboundary movements of certain LMOs imported for specific uses. Basically, delegates are still divided as to whether the protocol should promote or ensure the safe transboundary movement of LMOs.

There were ample but inconclusive discussions throughout BSWG–4 of the procedures for the authorization of transboundary movements. Some delegates maintained that an "advanced informed agreement" procedure, including a complete scientific assessment of risk, should be followed for all imports, while others argued for simplified procedures for "subsequent" imports or for imports of LMOs used only in controlled laboratory conditions. More discussion—supported by the presentation of hard

Tree of life
Illus.: Roelof Idema

data on the scientific, legal and technical implications of the various options—will be needed to clarify these issues.

The most contentious issue now is that of liability and compensations. Developing countries want an article that sets out clear provisions for redress of damages to biodiversity from LMOs, while developed countries claim it is already covered by general provisions of the CBD (Article 14.2) and international law. Little progress was made on this subject during BSWG–4, and several delegates acknowledged that they were ill-equipped to discuss such a complex issue at this time. Here again, a critical and independent assessment of the implications of different options is vital to future negotiations.

BSWG was mandated by COP–2 (Jakarta, 1995) to produce a fully negotiated protocol by the end of 1998. With time running short, the delegates seemed to be increasingly tempted to defer difficult debates and decisions until the first meeting of the Parties to the Protocol. This reporter believes that, in most cases, little can be gained from doing so.

A NEW DEADLINE

BSWG–4 requested advice from COP–4 (that met in Bratislava in May 1998) on a series of organizational issues. Apparently satisfied with the progress on substantive content made by the Working Group, delegates to the COP only discussed organizational items and not the proposed content of the protocol. Subsequently, the deadline for completing the negotiations and for holding an extraordinary COP to adopt the protocol was moved to February 1999. As well, financial provisions were approved for the implementation of the protocol after it is adopted.

NGOS AND INDUSTRY

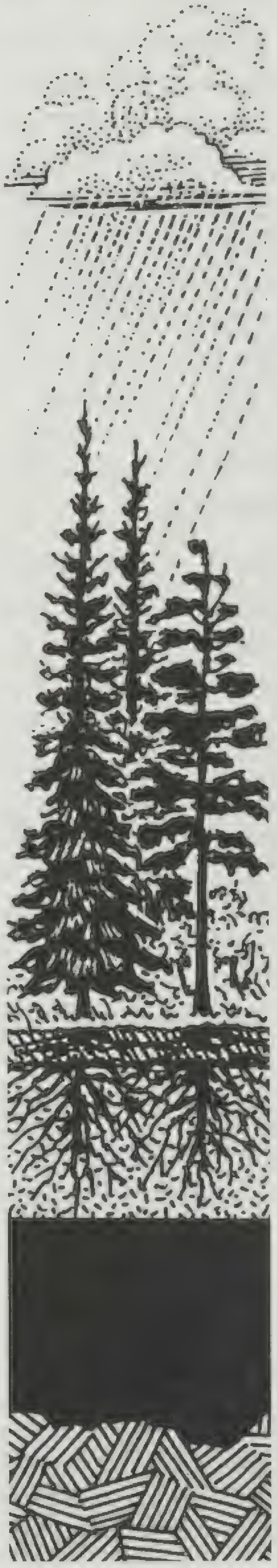
The biotechnology industry and environmental NGOs were well represented at BSWG–4. Industry representatives presented fully coordinated positions through the distribution of briefing notes and position papers, and a series of lunchtime seminars that emphasized the potential benefits of LMOs for the economies and populations of developing nations. Delegates from these countries remarked that discussions on concrete strategies for the realization of such potential would have been more timely. They noted that new technologies developed in the North are frequently proposed to them, but that such technologies have rarely led to sustainable development or a significant increase in the quality of life of their citizens over the long term.

Before the opening of the meeting, the bureau of the BSWG–4 made a significant change to observer status for NGOs and industry. The decision allowed observers to follow the discussion but without the right to intervene or take an active part in the negotiation, and provided for the removal of all observers from the meeting rooms if requested by any government. This is a normal procedure at the United Nations, but it is clearly at odds with previous BSWG and CBD meetings. One hopes that it does not become normal practice at the CBD.

FUTURE AGENDA

A fifth meeting of the BSWG takes place in Montreal in August 1998 for which the current division of work (two subworking groups and two contact groups examining specific elements of the protocol) will continue. For BSWG to abide by the deadline of February 1999, serious negotiations on the most contentious clauses must begin in August. The question remains how global bargaining can proceed in a context where the different elements of the protocol are discussed in parallel in distinct rooms. Informal meetings between regional and economic groups, like the few held during BSWG–4, could greatly facilitate the process.

BIODIVERSITY MEETINGS



5–8 NOVEMBER 1998
Helping Heal the Land Conference
Victoria, BC
Contact: Tel: (250) 598-9056 / Fax: (250) 598-9076 / E-mail: <restore@islandnet.com> / Website: <http://www.islandnet.com/~restore>

9–11 NOVEMBER 1998
Assessing the Ecological Integrity of Running Waters International Conference
Vienna, Austria
Contact: Michael Kaufmann, Dept. of Hydrobiology, Fisheries and Aquaculture, University of Agricultural Sciences, Max Emanuel-Strasse 17; A-1180 Vienna, Austria / Tel: 43(1)- 47654-5226 / E-mail: <confer@mail.boku.ac.at> / Website: <http://iwgf-sig. boku.ac.at/fish/hfahome.htm>

23-27 NOVEMBER 1998
Biodiversity, Biotechnology and Biobusiness: Second Asia–Pacific Conference on Biotechnology
Perth, Australia
Contact: Michael Borowitzca, Murdoch University, Biodiversity, Biotechnology and Biobusiness, Congress Werst Pty Ltd, PO Box 1248, West Perth, Australia, WA 6872 / Fax: 61-8-9322-1734 / E-mail: <biodiversity@science.murdoch.edu.au>

10–17 DECEMBER 1998
International Symposium on Sustainable Mountain Development: Understanding Interfaces of Andean Cultural Landscapes for Management
Quito, Ecuador
Contact: Dr. Juan Hidalgo, Director CEPEIGE, Apartado Postal 17-01-4173, Quito, Ecuador / Tel.: 593-2-541-200 / E-mail: <cepeige@uio.satnet.net> / Website: <http://www.uga.edu/clacs/Conferences. html>

18-22 JANUARY 1999
Joint NGO-Government Initiative to Address Underlying Causes of Deforestation and Forest Degradation (A Contribution to the Inter-governmental Forum on Forests): Global Workshop
TBA, Costa Rica
Contact: Global Secretariat, Simone Lovera / E-mail: <slovera@nciucn.nl>

24–27 JANUARY 1999
First National Conference on Marine Bioinvasions
Cambridge, Massachusetts, USA
Contact: Judith Pederson, MIT Sea Grant College Program, 292 Main Street E38-300, Cambridge, MA 02129 USA / Fax: (617)252-1615 / E-mail: <jpederso@mit.edu>

FEBRUARY/MARCH 1999

Third Session of the Intergovernmental Forum on Forests

Geneva, Switzerland

Contact: IFF Secretariat, Two UN Plaza, 12th Floor, New York, NY, USA, 10017 / Tel: (212) 963-6208 / Website: <http://www.un.org/dpscd/dsd/iff.htm>

15-19 FEBRUARY 1999

Biology and Management of Species and Habitats at Risk

Kamloops, British Columbia

Contact: Dave Fraser, Ministry of Environment, Lands and Parks; Tel.: (250) 387-9756 / E-mail: dfraser@fwhdept.gov.bc.ca, OR Karl Larsen, University College of the Cariboo; Tel.: (250) 828-5456 / E-mail: klarsen@cariboo.bc.ca, OR for sponsorship information, contact Tom Rankin, University College of the Cariboo, Tel.: (250) 371-5773 / E-mail: speciesatrisk@cariboo.bc.ca

20 MARCH 1999

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Contact: Board of Managing Editors, *Journal of International Wildlife Law & Policy*, 1563 Solano Avenue, Suite 193, Berkeley, CA 94707 / Tel.: (510) 540-0980 / E-mail: <JIWLP@earthling.net>

APRIL 1999

Eighth Session of the FAO Commission on Genetic Resources for Food and Agriculture

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Contact: FAO, Viale delle Terme di Caracalla, Rome, Italy, 00100 / Tel: 39-6-52251 / Website: <http://web.icppgr.fao.org>

3–7 MAY 1999

The Application of Scientific Knowledge to Decisionmaking In Managing Forest Ecosystems

Asheville, North Carolina, USA

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7–9 MAY 1999

Global Biodiversity Forum (GBF)

San Jose, Costa Rica

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1–7 AUGUST 1999

World Indigenous Peoples' Conference on Education

Hilo, Hawaii, USA

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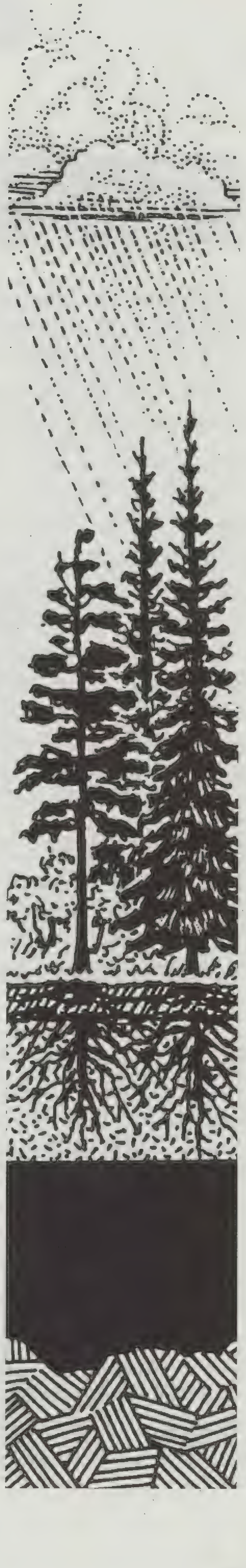


BOOK REVIEWS

Biodiversity: Exploring Values and Priorities in Conservation

Perlman, Dan L. and Glenn Adelson. 1997. Blackwell Science, Inc., Malden, Massachusetts. ISBN 0-86542-439-X. Paper. 192 pages. (US) $36.95

In *Biodiversity: Exploring Values and Priorities in Conservation,* authors Dan L. Perlman and Glenn Adelson investigate the role of human values in defining, evaluating and prioritizing biodiversity. This is not a book about biodiversity per se, but about how we think of biodiversity. They argue for an inclusive decision-making process open to a wide range of values espoused by conservation biologists, farmers, healers, politicians, indigenous peoples, business people, artists and other stakeholders, "so that we can truly appreciate all that biodiversity is and all that biodiversity can offer to humans."

Perlman and Adelson's work is both thoughtful and thought-provoking. They begin with an overview of key limitations of current definitions of biodiversity and of the criteria most commonly used to prioritize its component elements. Subsequent chapters centre on the relationship between human values and biodiversity. The authors demonstrate how biodiversity is context-dependent, shaped in large part by observers' values. They examine how one's choice of research techniques can generate markedly different assessments of biodiversity. They address some ambiguities associated with biodiversity's component parts—the gene, species and ecosystem—and the arbitrary, often value-laden boundaries we impose upon them. Finally, the authors examine the subjective nature of the field inventory, an essential tool in any priority-setting process. Only those aspects of biodiversity that have been accurately documented can be prioritized. Hence, inventory takers make many value-based choices when deciding which subsets of biodiversity to include in their studies.

The authors also focus on how the conservation priority-setting process itself is shaped by the values of those involved. The intent here is not to discredit value-based processes, but to urge individuals engaged in conservation to clarify the values underlying their goals and priorities. Noting that the "planet's biodiversity is not the sole domain of conservation biologists", the authors advocate a participatory decision-making process to accommodate and validate the values of all stakeholders whose livelihood and well-being are linked to biodiversity. The book closes with a sampling of subjective rationales for protecting various aspects of biodiversity.

Biodiversity: Exploring Values and Priorities in Conservation is a lively, engaging and informative read. Perlman and Adelson's lucid, mostly jargon-free writing style, accented with numerous compelling case studies and stories, is well tailored to the book's intended audience, including legislators, policy planners and business people in resource-based industries. This book is a timely and important contribution to the current discourse on biodiversity as it challenges readers' assumptions and preconceptions.

There remain a few concerns that this book has not fully addressed. Although the authors argue for inclusive, multi-stakeholder, priority-setting processes, they fail to convey just how complex participation can be. Broad stakeholder involvement does not, in itself, guarantee consensus. A deeper exploration of biodiversity's intrinsic values would have been appropriate. Also, there is a need for a modicum of humility in deference to nature that can be achieved by honouring the right of all living things to exist regardless of the value humans may assign them. Failure to recognize this reinforces the anthropocentric, resourcist worldview that is a factor in the current biodiversity crisis.

"… systemic social change towards a less exploitative, more sensitive, human interaction with the environment is the only solution to the biodiversity crisis."

On a more fundamental level, I distrust assertions that frame biodiversity conservation as "either/or" or "win/lose" propositions. By setting conservation priorities, we chose to protect some elements of biodiversity at the expense of others. In the short term, I concede that conservation priorities are necessary. However, over the long term, systemic social change towards a less exploitative, more sensitive, human interaction with the environment is the only solution to the biodiversity crisis. By failing to even hint at the need for such change, I wonder if the authors' silence on this matter is an endorsement of the status quo.

Nevertheless, I consider this book a significant contribution to the growing discourse on biodiversity and conservation. By exposing biodiversity as a value-laden concept and illuminating the subjectivity of our attempts to assess and evaluate its components, Perlman and Adelson open readers' eyes to the non-technical and political side of biodiversity.

Jean-Marc Daigle, Ecological OutLook / Earth and Spirit Restoration Centre, Schomberg, Ontario

Biodiversity Information: Needs and Options

Hawksworth, David L, Paul M. Kirk and Stella Dextre Clarke (eds). 1997. Oxford University Press, London, UK. ISBN 0-85199-183-1. 194 pages. (US) $60.

Sound resource management decisions depend on our ability to get quality information. Advances in information management and communication technologies drive the development of tools that will greatly improve our decisions around land use and resource management.

Biodiversity Information: Needs and Options is the published proceedings of the International Workshop on Biodiversity Information. This meeting, sponsored by CAB INTERNATIONAL (CABI), International Union of Biological Sciences (IUBS), International Union of Forestry Research Organizations (IUFRO), United Nations Environment Programme (UNEP) and the World Conservation Union (IUCN), took place in London at the Imperial College of Science and Technology in 1996. The proceedings include 12 papers by different authors followed by a short list of conclusions and recommendations.

Following a brief review of the importance of biodiversity, the book addresses three broad topics:

- defining and meeting the need for biodiversity information;
- identifying how information might be collected and managed; and
- identifying how information needs to be distributed.

The first section reviews the need for biodiversity information, with specific examples from agriculture, forestry and conservation biology. The authors stress the importance of integrating various kinds of biodiversity data with opportunities for utilizing properly managed biodiversity information and incorporating biodiversity into economic planning.

The second section reviews current sources of information and how this multisource information should play a central role in our developing knowledge bases. Two key points are the potential use of indigenous knowledge and associated intellectual property rights (IPR). Issues of data custodianship and approaches to overcoming the cultural barriers to data sharing are discussed.

Following a short introduction to the Convention on Biological Diversity's proposed clearinghouse mechanism (CHM), the final section deals with system design issues. Topics include the identification of user needs, the use of global area networks to disseminate information and the role of other recent advancements

"… Northern patent offices grant researchers exclusive rights over plants and micro-organisms 'discovered' in indigenous territories and thus violate and jeopardize the extended social contract between peoples and the land."

in information technology to enhance the distribution of biodiversity information.

Since 1996, more people are aware of the enormous potential of large-capacity computational systems coupled with advanced information management theory to revolutionize the way we collect, manage and use biological information. Unfortunately, we have made little progress in addressing related issues such as IPR, user needs and the cultural barriers to data-sharing. This book is a good introduction to this increasingly important arena of activity in biodiversity management. It gives insight to coming information management developments and should be of interest to anyone involved in the development of biodiversity programs.

Larry Speers, Coordinator, Canadian Biodiversity Information Initiative, Ottawa, Ontario

Protecting What's Ours: Indigenous Peoples and Biodiversity

Rothchild, David (ed.). 1997. The South and Meso American Indian Rights Center (SAIIC), Oakland, California. 93 pages.

Marcela Machaca Mendieta of the Asociación Bartolomé Aripaylla (APA), a Quechua farmers organization in Ayacucho, Peru, describes her relationship with the crops she cultivates in *Protecting What's Ours: Indigenous Peoples and Biodiversity*: "In Andean cultures, we believe that... everything in the world is like a person.... It should be viewed like a person in the sense of protection, attention and affection, because at some other time, it will offer us food, or in other words, it will care for us."

The biological diversity that is of increasing interest to Western researchers (whether the resource-laden rain forest or the "potato belt" of the APA farmers) is typically reflected by indigenous peoples as a bond of mutual dependency between them and their land. Unfortunately this bond is neither appreciated nor respected by many outside researchers. Indigenous peoples' organizations around the world say that Northern patent offices grant researchers exclusive rights over plants and micro-organisms "discovered" in indigenous territories and thus violate and jeopardize the extended social contract between peoples and the land.

Protecting What's Ours provides a concise and timely overview of a growing conflict. Published by the South and Meso American Indian Rights Centre (SAIIC), the book advocates a rights-based approach with an emphasis on how indigenous peoples in Latin America are organizing to advance their rights at the international and community levels. The Quechua APA is one of three organizations profiled that work to protect and revitalize indigenous traditions of crop and ecosystem conservation at the local level. The authors also discuss the Pemasky in Kuna Yala, Panama and the Instituto Amazanga in the Amazonian headwaters.

The compilation includes a short history of ayahuasca, a sacred, ceremonial plant used throughout the Amazon and patented in the United States by the bioprospector Loren Miller. The book also focuses on recent developments in US intellectual property law that make it easier for outside researchers to obtain patents over indigenous knowledge and resources and on the international processes (such as GATT-TRIPs) that threaten to extend a US-style patent system around the globe.

On the side of indigenous rights, the book includes excerpts from the Convention on Biological Diversity and ILO Convention 169 and a discussion of how indigenous organizations are working to advance alternative models of indigenous cultural rights in the international arena. The guidelines for dealing with bioprospectors, reproduced from Darrell Posey and Graham Dutfield's *Beyond Intellectual Property*

Rights, are particularly useful for organizations at the community level.

The patenting of living things is a new development in Western law and the legal instruments that seek to expand or curtail this trend are still under interpretation. New practices may soon supersede many of the recommendations found in this book. Protecting what's ours is not the last word on these issues, but it gives a timely and informed overview of the current situation. In addition to being a useful tool for the communities most directly affected by bioprospecting, the book is a valuable contribution on the subject of biodiversity for Western researchers and policymakers.

Craig Benjamin, Communications Director, Cultural Survival Canada, Lanark, Ontario

Conservation in Highly Fragmented Landscapes

Schwartz, Mark W. (ed.). 1997. Chapman and Hall, New York, NY. ISBN 0-41207-031-6. Paper. (US) $49.95

Mark Schwartz has brought together a timely collection of papers on the choices in conservation biology for regions where small, highly isolated natural habitats are the norm. *Conservation in Highly Fragmented Landscapes* addresses challenges associated with loss of habitat and natural systems in fragmented regions, notably Illinois and other regions of the US Midwest. It is intended for academics, policymakers and land managers and seeks to provide information vital to the professional development of all these groups.

As the editor points out, the book is unique in conservation biology. Most other treatments of the subject tend to focus on restoration and conceptual models for landscapes that are not yet entirely fragmented. In these situations, landscape corridors, protected areas and other means are advocated to regulate, moderate and reverse losses through restoration. In the highly fragmented landscape however, loss of habitat and natural systems has proceeded to the point where change is extensive and typically has occurred over a long period. The choice is not between "many small or a few large" but between "small, intact" and "large, degraded". In highly fragmented landscapes, according to Schwartz, the conservation program is also unique to the setting. It includes restoration, capture and release programs, finding out what is for sale, and convincing the public that more deer is not necessarily better.

The book is rich in data with 19 papers from over 30 authors and is divided into three parts. Part I deals with the historical evolution and current status of forest, savanna and open woodland communities, the tallgrass prairie mosaic and wetlands of the Midwest. These papers provide excellent illustrations of the application of historical analysis and relevant theory.

Part II discusses problems and case studies covering non-indigenous species; the impact of deer, mammals, birds, aquatic organisms and fire; biogeography and habitat loss; the role of seed banks; and livestock grazing. The papers are generally well argued, although some papers do not reflect more recent findings. The papers on deer, aquatic organisms and fire were especially useful to this reviewer.

Part III deals with conservation strategies in action with papers on: terrestrial reserve design; the value of small preserves; nature reserves and natural areas; the conservation of endangered and threatened species; critical trends assessment; and the history of natural areas progress in Wisconsin. While this section contains much useful information, it is the least satisfactory section of the book for a number of reasons. The papers tend to focus too much on management and the role of the scientist manager and not enough on the concerns and needs of the citizen. Challenges in communications, negotiations, economics, land-use planning and decision-making are not sufficiently addressed. A thorough coverage would, however, be beyond the reach of a book that stresses the ecological approach.

Overall this is a unique contribution, a worthy and useful synthesis of challenges in conservation biology and management. I found it useful when reflecting about conservation challenges for the highly fragmented landscapes of Ontario. We need a comparable book for this area and for other parts of heavily settled North America.

Dr. Gordon Nelson, Heritage Resources Centre, Environmental Studies, University of Waterloo, Ontario

“There is no point
in winning a battle to conserve a piece of land,
only to have its systems disintegrate
from stresses outside.”

Beyond the Ark: Tools for an Ecosystem Approach to Conservation

Weeks, W. William. 1997. Island Press, Covelo, California. ISBN 1-55963-393-X. Paper. 72 pages.

For nearly half a century, the Nature Conservancy has worked on preserving biodiversity through protecting ecosystems. In becoming the largest conservation organization in the United States, the Conservancy has secured protection of more than 9 million acres of land in 50 states and Canada, and has helped similar organizations protect millions of acres in Latin America, the Caribbean, the Pacific and Asia.

Counting acres, however, is not the same as counting species saved from extinction, and that is William Weeks' central theme in *Beyond the Ark: Tools for an Ecosystem Approach to Conservation.* Which species should we save, in which ecosystems? How can we find funds and commit partners? When do we announce victory or cut our losses? How can we measure progress? What criteria will help evaluate our progress or revise our strategies? Weeks illustrates their current mission and modus operandi by lesson, lecture and parable.

The Nature Conservancy uses a variety of tenures and agreements besides purchase. Its network of biological inventories—called Natural Heritage Programs in the United States and Conservation Data Centres (CDC) elsewhere, of which there are four provincial CDCs in Canada—allows government agencies to quickly identify threats to rare and endangered species and ecosystem elements. This capability helps government parks conserve biodiversity in their jurisdictions. In turn, staff of these agencies make enormous contributions of time and expertise to the Conservancy's projects, and these contributions are magnified by those of thousands of volunteers. Work is decentralized through local advisory boards, which encourages innovation and flexibility with a "continuity of purpose." The conservancy style is non-confrontational: they don't publicly criticize governments, but meet with them privately to work out differences.

The Conservancy's ecosystem approach to conservation is captured by the five S's: systems, stresses, sources, strategies and successes. Systems include economic and social systems as well as ecosystems that function beyond the geographic borders of conservation projects. Systemic stresses must be identified and their sources sought, whether inside or outside a conservation area. There is no point in winning a battle to conserve a piece of land, only to have its systems disintegrate from stresses outside. Strategies are pragmatic: don't try to make the source of stress a better person, agency or institution; just solve the immediate problem. Strategies are the climax of the plan, and they are all about people and communities. In defining success, the challenge is to measure progress towards it. Thus, the planning discipline reveals itself to be circular: a vision of success is a good starting point.

Beyond the Ark should be required reading not only for people in conservation organizations to whom it is principally addressed, but also for anyone who manages land, whether private or public. It sets out the pitfalls in planning preservation campaigns, as well as the potential savings in the principle asset of our planet—its diversity of life—through an ecosystem approach to conservation.

Lee Harding, Consultant in Environmental Management and Education, Kootenay Mountains, British Columbia

Qui a peur de l'an 2000 ?

Villeneuve, Claude. 1998. Èditions MultiMondes.
ISBN 2-921146-55-X. 328 pages

Claude Villeneuve has already introduced readers to his shock-value titles with his first book *Des animaux malades de l'homme?* (1983) and his subsequent work entitled *Eau secours !* (1996). He does it again with the latest work *Qui a peur de l'an 2000 ?* In this book, he focuses on the environment and the development of our planet. He tackles the huge challenges that the Earth faces one by one: acid rain, ozone layer thinning, climate warming, deforestation, armaments, population growth, North-South relations, fisheries, energy, security, women and education, to name a few. Readers who lack the time to inform themselves on all these issues will find this book a clear documenting of the many stresses that impact our world.

Villeneuve's approach is innovative and instructive. He addresses each theme through a simulation exercise, often using the most recent qualitative and quantitative data. He then explains broader, related issues; discusses uncertainties of outcomes; comments on the obstacles to modifying individual or collective behaviours; and proposes solutions.

However, he shocked this reader by stating that sustainable development does not exist; that it is only an hypothesis and a form of analysis and prediction. While I agree that this statement can be read as a tool for debate, it is ultimately a confounding point. It becomes hard to reconcile this view with previous positions held by the author, in which he has argued for sustainable development. It is also surprising to see, given Villeneuve's denial of practical sustainable development, that the introduction to his book has been written by the president of the UNESCO committee responsible for monitoring the environment and development measures taken at the Rio Summit, Francisco di Castri.

A chapter on biodiversity focuses specifically on the transformation of ecosystems and the accelerating depletion of biological diversity with respect to desertification and deforestation. For him, the main hurdles to achieving a healthy biosphere are a) the difficulty of comprehensively and accurately defining the current reality coupled with b) the Noah's Ark paradox (that is, choosing which species to protect). In response, Villeneuve proposes various ways to better educate people about biodiversity.

The book suffers from the absence of discussion on what Canada and Quebec have done about biodiversity. This is especially lacking as the strategy and action plan announced in 1996 by the government of Quebec follow the same line of proposals presented by Villeneuve. Furthermore, the Quebec strategy and action plan demonstrate in a practical way that we can go further than the models set out by Villeneuve in chapter four of his book. Several countries are using the Quebec approach to implement the Convention on Biological Diversity within their boundaries. Consequently, I would suggest to readers that they wait for Villeneuve to provide a revised and expanded version of this book.

Benoît Gauthier, Ph.D. (plant biology), ecologist, Centre de coordination et de suivi de la biodiversité, Ministére de l'environnement et de la faune du Québec

Paysages des marais

Donadieu, Pierre (ed). 1996. Éditions Jean-Pierre de Monza, Paris, France. ISBN 2-908071-33-9. Cloth. 199 pages

Paysages des marais is a book of rare beauty. As much by the illustrations as the text, it helps us discover the great diversity of France's marshes, their characteristics, their relative importance and issues concerning the future. It is an ode to the plant, animal and ecological diversity of these spaces, which cover 5.6% of French territory and are in some places perfectly wild and in others profoundly transformed.

The book includes many excellent photos that reflect the natural, bucolic and humanized aspects of the marsh environment that has so often been viewed as hostile and ugly. The maps and drawings provide useful information on:

- the distribution of marshes by type according to their distance from the sea and dikes;
- marsh plant diversity;
- plant zones according to gradient and slope height of the marshes;
- ecological characteristics of wetlands; and

- the geomorphological development of these landscapes.

The text is the work of about 30 ecologists, agrologists, researchers, landscape architects, lawyers, ethnologists and sociologists. From the first look at the table of contents, one is impressed. One hundred headings are used to describe and analyze, in four large sections, this habitat of a thousand faces. The scope of the book is wide and serious, yet it is accessible to the general public. It is a genuine history of the attitude of man toward the marsh which was often seen as sites of putrid exhalations and pestilence.

By its profitability, tourism is one of the favoured economic trends in land-use planning. While efforts in tourism, ecology and agriculture do not often overlap, they do share a need; that is, to develop and promote a new view of the marshes that can modify social practices. The tourism imagery thus attempts to seduce its target population by presenting the marshes not as sites of death, but as living environments with a wealth of plants and animals. Many marshes, previously salt marshes or agricultural marshes, have become spaces of ecological heritage, not only because of their great diversity but as important sanctuaries for huge numbers of migratory birds and other wildlife.

This book will be of interest to anyone concerned about the future of marshes and wetlands in general. While it deals with the French situation, the history, general characteristics, diversity issues and management and development of these wetlands remain basically the same all over our planet.

By describing the subject in great detail and appreciating its unique characteristics, this work is a convincing plea for all the wetlands of the world. The feeling of anxiety and fear that the marshes inspired in bygone days has been replaced by one of mystery, which is what makes them valuable today. The challenge will be to transform these mysterious spaces into familiar and useful spaces.

Marshes are habitats where natural biodiversity proliferates, but this biodiversity is increasingly threatened by all the limiting factors that human activities chemically and mechanically impose on it. It is crucial that we look to the future of this important environment in a conscientious and clear-sighted way.

Maxim Saint-Amour, Head Naturalist and Head of Interpretation Services, Forillon National Park, Gaspé, Quebec (retired)

NEW TITLES OF INTEREST...

Biodiversity and Human Health
Grifo, Francesca and Joshua Rosenthal (eds). 1997. Island Press, Washington DC. ISBN 1-55963-501-0. Paper. 380 pages.

Forests of Hope: Stories of Regeneration
Küchli, Christian. 1997. New Society Publishers. ISBN 0-86571-378-2. Paper. 256 pages. (CDN) $39.95 [US $29.95]

Les baleines de l'Atlantique Nord, biologie et écologie
Fontaine, Pierre-Henry. 1998. Éditions MultiMondes, Ste-Foy. Québec. ISBN 2-921146-42-8. 290 pages.

Le sol : interface dans l'environnement, ressource pour le développement
Robert, M. 1996. Éditions Masson, Paris, France. ISBN 2-225-85177-8. 244 pages.

The Butterflies of Canada
Layberry, Ross A, Peter W Hall and J Donald Lafontaine. 1998. University of Toronto Press, Toronto, Ontario. ISBN 0-8020-7881-8. Paper. 280 pages. (CDN) $29.95 [£20.00 Europe] / ISBN 0-8020-0898-4. Cloth. (CDN) $100. [£60.00 Europe].

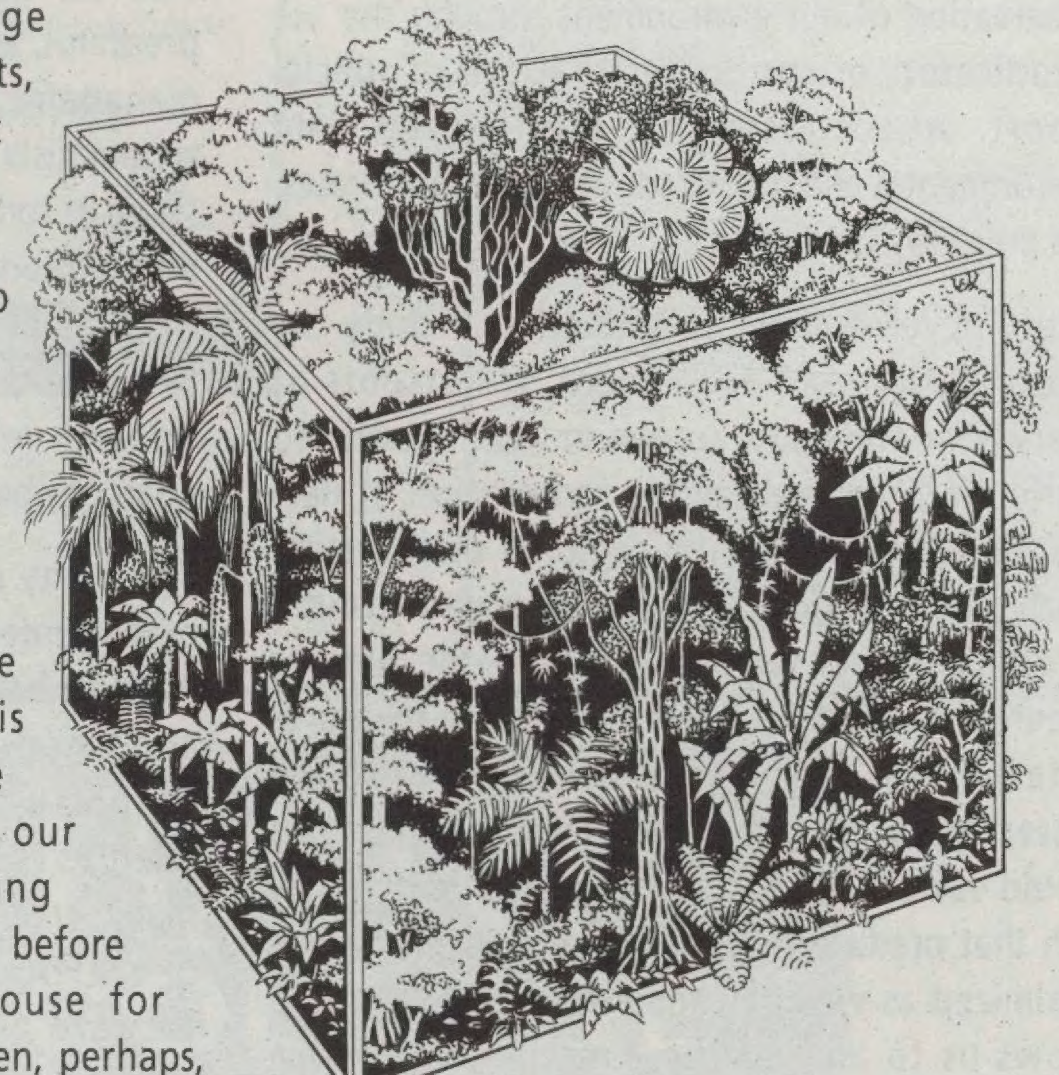
Working for Wildlife: The Beginning of Preservation in Canada, 2nd ed.
Foster, Janet. 1998. University of Toronto Press, Toronto, Ontario. ISBN 0-8020-7969-5. Paper.

THE LAST WORD

Taking stock

Systematics, classifying and naming the earth's biota, is the first step to understanding how to care for our planet

Imagine trying to manage a huge warehouse full of all kinds of objects, many with unique needs for treatment and care, but you don't even have a complete inventory of what's on site. This is what humanity is attempting to do with Earth's biodiversity.



To date, scientists have described only 1.4 million species of living organisms out of the 10 to 30 million thought to exist on the planet. Frankly, at this stage, we don't know what the biodiversity of Earth is, how it is distributed, or how it evolved, let alone how it should be managed. Given our present slow rate of documenting biodiversity, it will be many centuries before we can open this natural warehouse for widespread use by humankind. By then, perhaps, it won't be important as many (if not most) of these species will be extinct.

A world without biodiversity is a grossly impoverished one; its wise management is critical to the survival and prosperity of the human species. To effectively use biodiversity, a profound understanding of its detail is required. We need to know the patterns in diversity and the natural history of individual species, and, at the most fundamental level, how to distinguish one component from another. Humanity cannot manage a complex system without a set of names for its components.

Systematics is the science of naming and classifying organisms based on an understanding of their evolutionary relationships. It plays a central and unique role that, until recently, has been fairly low profile in biodiversity management. Systematics provides not only the means by which organisms are accurately named, but also their natural and predictive classifications. These classifications are the building blocks of knowledge about biodiversity, describing how and where information is stored and subsequently communicated. Classifications are also the

A FEW WORDS ABOUT THE CANADIAN MUSEUM OF NATURE

The origins of the Canadian Museum of Nature (CMN) were formed within the Geological Survey of Canada in 1842. Over 150 years later, the CMN has some 10 million specimens in its collection—which still represents only half the known species in this country—and an active team of scientists, collection managers, education specialists, and business experts.

The CMN's mandate is to increase knowledge and understanding of, appreciation and respect for, and interest in the natural world. This role has never been more crucial, as the demand for environmental harmony between the world's burgeoning human population and nature reaches a critical point. For more information about the Museum's activities, please contact Joanne Charette, Corporate Communications at (613) 566-4249.

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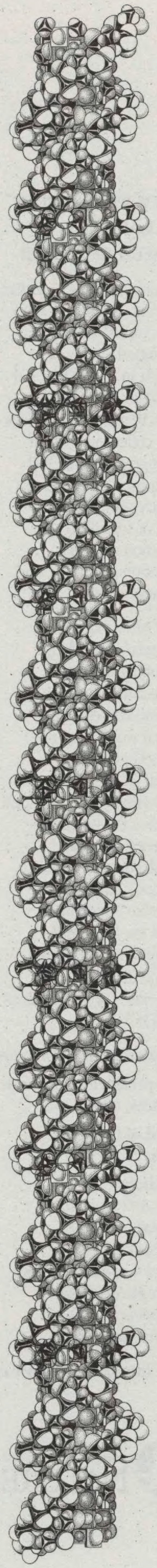

basis for predictions about the features of recently discovered organisms, such as geographic distributions, habitat associations, habits and even physical or chemical attributes. Natural classifications are essential tools for strategically planned bioprospecting programs as they facilitate the recognition of organisms that have a high likelihood of direct value to humanity.

Most importantly, the predictive nature of systematics allows us to maximize our limited and fragmentary knowledge of the whole of biodiversity. This science helps to establish strategies for the wise management and conservation of our environment through the use of indicators or surrogates that are of special import when resources are limited and environmental change occurs at accelerated rates, as is presently the case.

Recent developments in systematics include the identification and assessment of hotspots of diversity or endemism (organisms with restricted distributions), as well as the formulation of new approaches to measuring regional biodiversity, which take evolutionary relationships into account. Recognizing that we may not have the time or resources to conserve everything, these measures of taxonomic diversity assist in making sound conservation decisions. Ideally, these decisions should seek to maximize phylogenetic diversity such that predicted divergence among the taxa is maximized as well. In simple terms, this method allows us to answer the question: Is it more effective to conserve one species each for reptiles, amphibians, birds, mammals and insects or to conserve five species of ants?

Systematists gives us a special insight into our current state of knowledge on biodiversity. Yet, systematics resources throughout the world are declining: positions in universities and government agencies lost to retirement and downsizing are not being restaffed; training opportunities are lapsing; student enrollment in the field is down; and grant support is harder to find. This decline is because those who pay the bills do not see a return on their investment. When systematics provides a visible and accessible product that people understand and want, they will pay for it.

Over the last 200 years, systematists have published the results of their work in myriad specialized journals, books and reports. This body of information is accessed by specialized users (largely other systematists) but is not available to, or seen as useful by, society as a whole. Systematists need to demonstrate the social relevance of their work to the larger community. To do so now when biodiversity is imperiled, their work should be more visible and engaging. For instance, we can include systematics in environmental monitoring efforts, in regional and national biodiversity or sustainable development efforts, in general environmental training programs, and in the development of specific land management and conservation efforts. Further, systematists should write about the organisms they study in terms that can be integrated with similar information from other fields. The development of natural history collection databases and an increased use of the World Wide Web to promote research results are a few ways in which these goals can be achieved.

The many contributions of systematists to the management and conservation of biodiversity need to be seen by society as innovative, central and critical. Beyond the traditional, descriptive and supportive role it has played in the natural sciences, systematics speaks to the concerns of many sectors of our society, not just the specialized or the expert. It is time for systematists to step forward and assume a leadership role in the strategic management of biodiversity as well as its documentation. Only then will this field get the recognition and resources it deserves to help ensure the biodiversity of the planet.

Robert S. Anderson
Research Scientist
Canadian Museum of Nature

From scientists and policymakers to educators and students, the Center for Biodiversity and Conservation engages the whole community in biodiversity conservation. Through international fieldwork, workshops, and publications, the Center brings science to the forefront of the conservation process.

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IUCN Red List of Threatened Plants

This book represents a milestone in the history of Red Data books and lists, compiled by a consortium of scientific institutions, it provides the first-ever published list of vascular plants recorded as globally Rare, Vulnerable, Endangered, or Extinct. The current volume lists 33,798 species as threatened, resulting in the grim statistic that over 12.5% of the world's vascular flora is threatened at the global scale.

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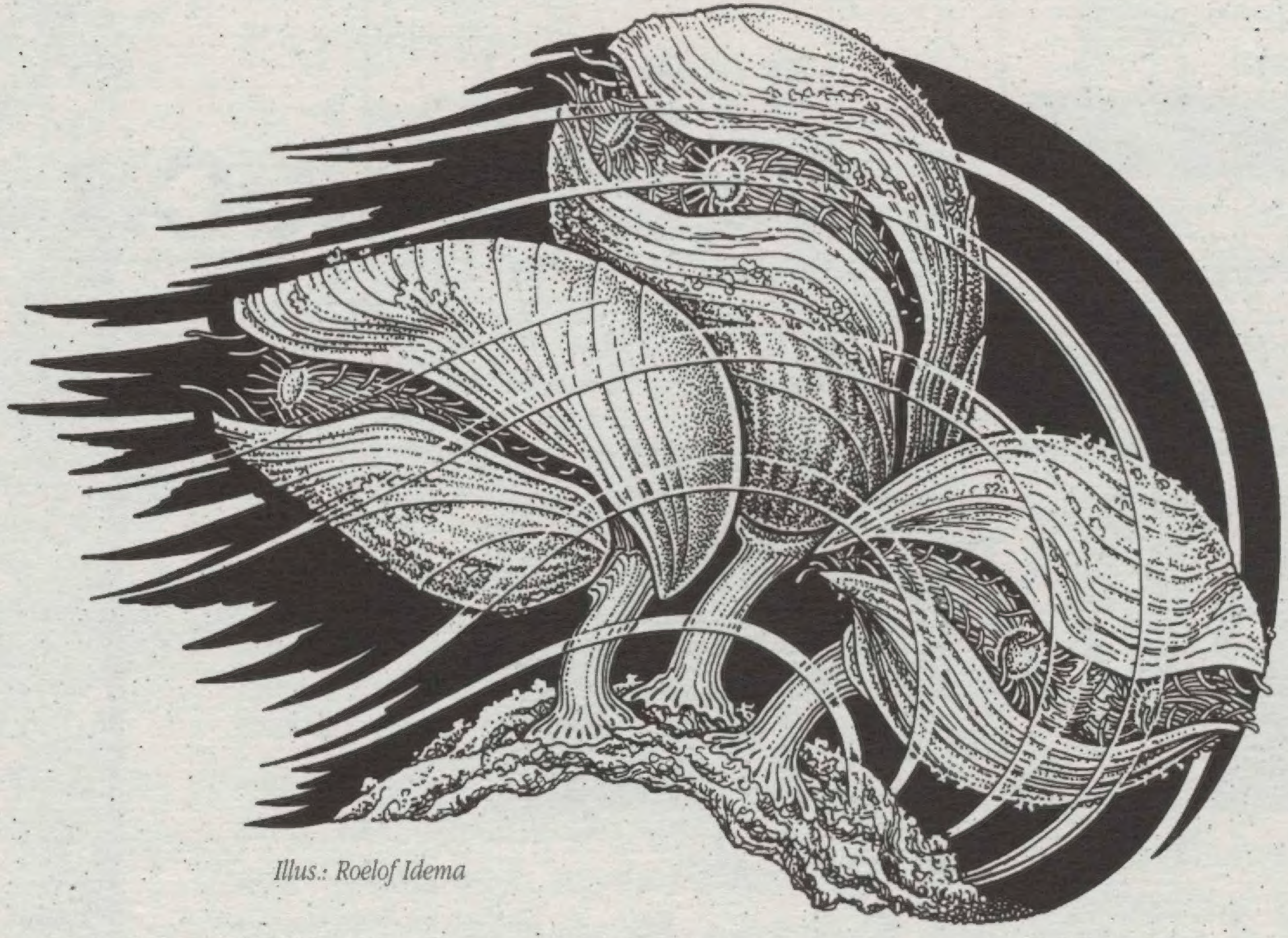
>
> Aristotle (384-322 BC)
> *On the Parts of Animals*



Illus.: Roelof Idema

Terebratulina sp. is a typical articulate brachiopod. It usually lives in offshore waters on stalks that adhere to rocks with the shells hanging free in the water, sometimes in clumps. As it is an articulate, the shell is calcified, and the lophophore (visible through the opening) is supported by a skeletal frame.

The goals of *Global biodiversity* are to:

▪ Publish articles, views, and news on biodiversity ▪ Bridge the gaps between professional disciplines & the public ▪ Communicate vital information to help humankind make decisions on the fate of the Earth's life ▪ Express views on the needs & value of biodiversity research ▪ Provide an international forum for discussing issues on biodiversity ▪ Enhance awareness of the role of biosystematic research & museum collections to conservation & ecologically sustainable use of biodiversity ▪ Discuss methods and philosophy of biodiversity conservation ▪ Review books and periodicals on biodiversity

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